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THE FIBER TRACTS OF THE FUSED THORACIC GANGLIA OF THE ADULT *EPHESTIA KUEHNIELLA* ZELLER (LEPIDOPTERA: PYRALIDÆ)

BY ROBERT W. PYLE

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The histology of the nervous system of the various orders of insects has been studied by many biologists, but nearly all of these have been concerned with the brain. As Snodgrass (1935) has stated the fiber tracts of the thoracic ganglia of an adult winged insect have not been worked out. Zawarzin (1924) has studied the ventral ganglia of *Æschna* larvæ; his figures and descriptions are excellent. Other workers, Binet (1894), Graichen (1936), etc., while studying the ganglia other than the brain have failed to elaborate upon the fiber tracts.

I wish to thank Prof. C. T. Brues, under whose guidance this work has been carried out, for helpful suggestions and criticisms, and Prof. F. M. Carpenter for reading the manuscript.

Adult *Ephestia* were fixed in Bouin-Duboscq-Brasil, embedded in tissuemat and serial sections cut at 10 micra. The sections were stained by the protargol method of Bodian (1937).

The fused thoracic ganglia of adult Lepidoptera in general are composed of the second and third thoracic and the first

three abdominal ganglia of the larva. This ganglionic mass is roughly rectangular in shape (figs. 1 & 2), and is constricted near the middle (anterior-posterior aspect). The anterior portion, more conveniently termed the anterior lobe, is composed of the two larval thoracic ganglia (Th. II & III), whereas the posterior lobe is composed of the first three larval abdominal ganglia (Abd. I, II, III). These lobes are identified by a prominent tracheal tube (figs. 1 & 2 Tr.) which passes dorsad between them from the ventral surface of the ganglia in a median (dextro-sinistral) position. They are further differentiated by a noticeable constriction in the neuropile. (In these figures the neuropile is white and the ganglionic cell layer stippled. For the sake of clarity fiber tracts are shown as single fibers.)

In sagittal view (fig. 2) there are five bundles or tracts of fibers which enter the anterior lobe of the ganglia from the pro-mesothoracic commissures (c). The uppermost bundle (fig. 2 p) consists of motor association fibers originating in the prothoracic ganglion and extending to the posterior lobe of these fused ganglia. Fibers are given off from this bundle and ramify among the fibers of the neuropile of both lobes. Below this bundle there is a large fibre tract (fig. 2, q) which passes through the entire length of the ganglionic mass; side branches are given off which extend into the neuropile of each lobe. These are motor fibers originating in the brain and extending through the ganglionic mass.

The middle bundle of fibers (b) is quite large and ends in the neuropile of the anterior lobe. These are sensory fibers which come directly from the wings. It is quite surprising to find such a large bundle of nerve fibres which can be traced directly into the wings themselves, but this is more readily comprehended when one considers the large number of olfactory pores found on the wings of Lepidoptera by McIndoo (1917). In *Ephestia* this bundle leaves the pro-mesothoracic commissure (c) at a point just posterior to the prothoracic ganglion.

The fourth bundle of fibers (fig. 2 r) is comparable to the second in that it extends throughout the entire mass of fused ganglia passing toward the abdominal ganglia. It originates in the region of the brain and is composed of sensory fibers; side branches are given off to the neuropile of both lobes.

The lowest bundle of fibers (a) is the ventral counterpart of the uppermost group. These fibres originate in the prothoracic ganglion and end in the posterior lobe of the fused ganglia. Like the other bundles this one has side branches which ramify among the fibers of the neuropile in both lobes.

The association fibers (j') which come from the abdominal region ramify among the fibers of the neuropile of the posterior lobe, but do not extend to the anterior lobe. There are association fibers, located on either side of the dividing line described above.

By examining the association fiber tracts (dorso-ventral, and dextro-sinistral) it is easy to differentiate the larval components which have contributed to the formation of the fused adult ganglia. There are well defined fiber tracts which extend from dorsal to ventral (n), and dextral to sinistral (e, j, k) areas (in both directions) in each section. Each group of fibers, on the whole, is confined to that portion of the ganglion which originally constituted a larval ganglion. In sagittal sections the dextro-sinistral fibers (o, o') appear as well defined bundles and in frontal sections the dorso-ventral fibers have a like appearance. There are two main regions of dextro-sinistral association fibers as seen in sagittal view. The dorsal region (o) contains the motor association fibers, and the ventral region (o') the sensory association fibers. Furthermore, each group of fibers gives off connectives to the adjacent groups; this assures communications between all sections.

The commissures to the mesothoracic legs (L 2 c) pass out of the ganglionic mass from the posterior lateral ventral portion of the anterior lobe; the motor cells (d) are located on the lateral anterior portion of the anterior lobe, e.g. that portion derived from the larval mesothoracic ganglion. Each of these cells gives off a large axon which in turn gives off a number of small branches to the neuropile before passing ventrally to the leg. There are a number of sensory fibers from the leg (f) which ramify among the various fibers of the neuropile of the anterior lobe.

Surprisingly enough the commissures to the metathoracic legs (L 3 c) leave the ganglionic mass at the posterior lateral point of the posterior lobe. The motor cells (h), however, which supply the neurones for these legs are located

on the posterior lateral surface of the anterior lobe, e.g. that portion derived from the larval metathoracic ganglion. These cells, like those supplying the mesothoracic legs, give off large axons which in turn give off side branches to the neuropile before passing to the leg commissure. The sensory fibers (l) which pass from the metathoracic legs to the ganglia end in the neuropile of the posterior lobe; one group ends in the anterior ventral portion and the other in the dorsal median area, but neither extends into the anterior lobe.

The motor fibers (g) which innervate the thoracic muscles (and thus supply the impulses for flight) originate in cells located in the posterior ventral lateral portion of the anterior lobe. These fibers pass dorsad in the neuropile and give off side branches to the surrounding areas, especially the dorsal motor area, and pass among the ganglion cells to the surface in a dorsal lateral position (W M C) from which point they pass directly among the thoracic muscles.

The axons of the motor cells of the posterior lobe (i, i', i'') all pass through the commissure (m) to the abdominal region. Each gives off fibers to the surrounding neuropile as it passes through it.

There are many small association fibers which pass from one section of the neuropile to another, but they have not been shown in the figures or discussed. This description is primarily concerned with the major tracts.

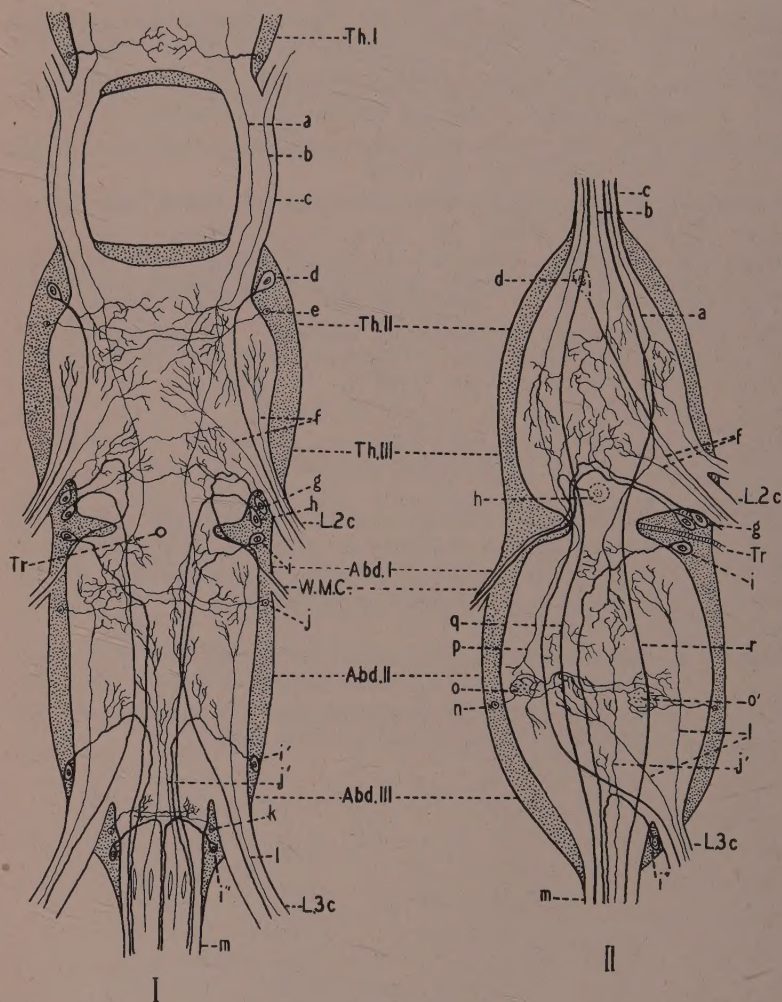
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DESCRIPTION OF PLATE 9

Fig. 1. A diagrammatic reconstruction of a frontal view of the fused thoracic ganglia of *Ephestia kuehniella* Zeller. The neuropile is white and the ganglionic cell layer stippled. For the explanation of the lettering see the text.

Fig. 2. A diagrammatic reconstruction of a sagittal view of the fused thoracic ganglia of *Ephestia kuehniella* Zeller. The neuropile is white and the ganglionic cell layer stippled. For the explanation of the lettering see the text.

Pyle — Thoracic Ganglia of *Ephestia*.

NOTES ON THE SPIDER FAUNA OF NEW ENGLAND

BY ELIZABETH B. BRYANT

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Nowhere, perhaps, in the New World, has the spider fauna of an equal area been more intensively studied than that of New England.

One of the first students of American arachnology was Nicholas Marcellus Hentz, (1797-1856). While confining himself chiefly to the study of spiders of Alabama and North Carolina, he received much material from his friend and correspondant, the well known New England entomologist, Thaddeus William Harris, (1795-1856). As was the custom of his time, Hentz wrote very brief descriptions, reliance being placed upon his colored drawings for ultimate identification. He described few new genera and distributed his species among the genera then known to Europe. From time to time, his papers were published in the *Journal of the Boston Society of Natural History*, covering the period from 1842 to 1867. Subsequent to the death of Hentz, the secretary of the Society, Edward Burgess, assisted by James H. Emerton, assembled these scattered records, and together with some few additions by Emerton, they were published in 1875 as the second volume of the *Occasional Papers of the Society*. The collections of Hentz, including his types, were dried and mounted on pins, in the manner of entomological specimens, with the result that today little remains but the labels in faded ink. The collection, together with his notes and such drawings as had not been distributed as souvenirs, became the property of the Boston Society, the present custodian.

The first to devote his entire attention exclusively to the New England region as a unit, was James H. Emerton, (1847-1931). When or why Emerton, who was a draftsman by training and of an artistic temperament by nature, be-

came interested in the study of spiders is a matter of speculation. However, as early as 1874, he was evidently familiar with a paper by the Rev. Octavius Pickhard-Cambridge, (1828-1917), of Devonshire, England, on certain minute European spiders, since early that same year he sent a collection of similar New England forms to Cambridge for study and identification. All these American forms were recognized as new and were described and figured by Cambridge in the Proceedings of the London Zoölogical Society for that year, 1874. A second collection of similar material was sent by Emerton to Cambridge and was described and figured in the same journal in 1875. There can be little doubt that with Hentz as a model, Emerton made colored drawings of his material quite early. These have never been published.

In 1875, Emerton went abroad, taking with him a portion of his New England material. Some time was passed at Leipzig and Jena in study but he continued to collect in the surrounding country. Later, in France, he met Eugene Simon, (1848-1924), who was to become the foremost arachnologist of his time. From this contact, a life long friendship began. Together they made collecting excursions in the vicinity of Paris, and many specimens from Simon were added to Emerton's European collection, including material from the Pyrenees and Corsica recently described by Simon.

As early as 1864, Simon, then sixteen years of age, had published a comprehensive work on spiders under the title of "*Histoire Naturelle des Araignées*" and was already occupied with his monumental "*Les Arachnides de France*" dating from the year 1874. It is perhaps to Simon's example and probable suggestion, that we are indebted for one of the least known of Emerton's writings, "*A Comparison of the Spiders of Europe and North America*", a short paper published in 1877, in the Proceedings of the Boston Society of Natural History, vol. XIX. In 1882, the first of his systematic studies, "*The New England Spiders of the Family Theridiidæ*" appeared in the Transactions of the Connecticut Academy of Arts and Sciences. The series was continued at irregular intervals in the same publication until 1915.

In 1904, the Boston Society of Natural History published

the first issue of its "Fauna of New England"; the ninth in the series, entitled "A List of the Aranea" appeared in April 1908. This listed 399 species. At the present time, 612 species have been reported, an increase of over 50%. Of these, Emerton has described 214 species, or over one third.

Since a comparison of the faunal lists of regions of similarly intensive study may have some interest, the following tabulation is included.

	Approx area (in sq. miles)	Species	Authority	Year
New England	65,000	612	Bryant	1941
New York	49,000	551	Crosby & Bishop	1928
Great Britain	89,000	556	Bristowe	1939

Possibly rather more than 10% of the spider fauna of New England is common to Europe. A number of species seemingly introduced by commerce have been established; such are *Theridion tepidariorum* C. Koch; *Scytodes thoracica* Latreille; and *Pholcus phalangioides* (Fuesslin.), all common house spiders. Others, probably circumpolar, are found across the continent but do not extend very far south. Of these we may mention *Cyclosa conica* (Pallas), *Aranea angulata* Linn., *Salticus senicus* (Linn.), *Zelotes subterraneus* (C. Koch). Of especial interest, is the discovery of *Cercidia prominens* (Westring), a northern Eurasian species, in a cold swamp in Holliston, Massachusetts, a locality from which several insects peculiar to the far north have been taken. This species also occurs in northern New England.

The following includes a description of one new species, two new names, a description of a European species new to New England, and new records of localities and a few corrections.

FAMILY OECOBIDÆ

Genus Tapinesthis Simon 1914.

Tapinesthis inermis (Simon)

Oönops inermis Simon, Ann. Soc. Ent. France, 1882, (6), 2: 240.

Orchestina saltitans Emerton, nec Banks, Trans. Conn. Acad., 1909, 14: 214, pl. 1, fig. 4.

Tapinesthis inermis Dalmas, Ann. Soc. Ent. France, 1916, 85: 242.

A pair of very small spiders was found in the basement of the museum of Natural History and figured by Mr. Emerton in 1909. Probably because they are very small and had but six eyes, he identified them as *Orchestina saltitans* Banks, the only six-eyed spider found in the north. Today, they are discolored by age and badly broken but it is evident that they do not belong to the genus *Orchestina* but, as Comte de Dalmas suggests, they may be *Tapinesthis inermis*, a species found in southern France.

Genus *Orchestina* Simon 1882

Orchestina saltitans Banks

Orchestina saltitans Banks, Ent. News, 1894, 5: 300.

Orchestina saltabunda Petrunkevitch, nec Simon, Ann. N. Y. Acad. Sci., 1910, 19: 207, pl. 21, figs. 2, 3.

Orchestina saltitans de Dalmas, Ann. Soc. Ent. France, 1916, 85: 240, figs. 35, 36.

These minute spiders (0: 8 mm.) are not often found in collections, probably because they are so small and colorless. They move very rapidly and because of the large femur of the fourth pair of legs, they can jump a great distance compared to their small size. A pair was found jumping on a window sill in Boston and they are not uncommon in southern Connecticut. The genus is based on a species from Corsica. Three more species are known from the Mediterranean area but *Orchestina saltitans* is the only species reported from North America.

FAMILY AGELENIDÆ

SUBFAMILY HAHNINÆ

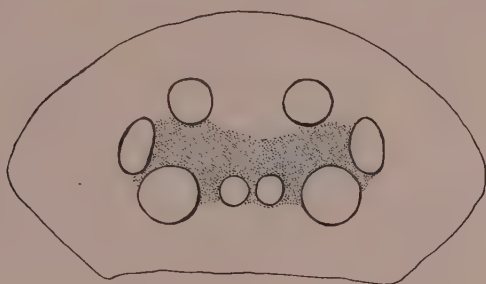
Genus *Hahnia* C. Koch 1841

Hahnia monticola sp. nov. (Fig. 1)

Female. Length, 2.3 mm., ceph. 1.0 mm, abd. 1.6 mm.

Cephalothorax pale yellowish-brown, shining, slightly darker about margin, black about the eyes, anterior margin less than half the greatest width, thoracic groove faint; *eyes*, anterior row almost straight, a.m.e. smallest of the eight, almost touching, posterior row longer than anterior, pro-

curved, eyes subequal, p.m.e. separated by almost a diameter and a half and from p.l.e. by a radius, lateral eyes touching; quadrangle of median eyes much narrower in front and as high as wide; *clypeus* below a.m.e. equals about a diameter of p.l.e.; *mandibles* vertical, attenuate, fang groove very short; *labium* as wide as long; *maxillae* twice as long as labium; *sternum* three-quarters as wide as long, heart-shaped, fourth coxae separated by more than a dia-



A



B

Figure 1. *Hahnina monticola* sp. nov. A, eyes; B, epigynum.

meter and sternum ending in an obtuse knob between, widest between second coxae, slightly convex, smooth; *abdomen* oval, widest on posterior half, flesh color with no markings, venter paler, opening of spiracle nearer spinnerets than to genital furrow, spinnerets in a straight line, distal joint of lateral spinnerets about half the length of basal joint, second pair with basal joint longer than that of lateral, distal joint very short, median pair separated by less than half a diameter; legs pale yellow, slender with a few weak spines;

epigynum showing two pairs of dark tubes beneath the skin, the median pair much the larger, decreasing in size, and slightly diverging, the lateral pair much smaller and curved.

Holotype ♀ New Hampshire; Mt. Washington, 5,000 feet, 1 July 1926, (Banks).

Paratype ♀ New Hampshire; Mt. Washington, 5,000 feet, 1 July 1926, (Banks).

This species lacks the abdominal pattern found on *Hahnina cinerea*, the anterior row of eyes is almost straight, the eyes are closely grouped and the epigynum is very unlike that species.

FAMILY PISAURIDÆ

Genus Dapanus Hentz 1867

Recently Mr. Banks has called to my attention a name proposed by Hentz that has been overlooked by recent students. In 1867, "A Supplement to the Descriptions and Figures of the Araneides of the United States", was posthumously published in the Proc. Boston Soc. Nat. Hist., vol. 11:103-111, with two plates, from notes and figures by Hentz. In the volume of the Occ. Papers Boston Soc. Nat. Hist., vol. 2, 1875, which contains the collected writings of Hentz and is commonly used, these notes are distributed, always in brackets, to the original descriptions, and in the introduction a brief note states the origin. On page 44 of the Occ. Papers under *Micrommata marmorata*, appears the following: "Prof. Hentz had formerly considered this to be the type of a new subgenus, for which he gave the name *Dapanus*, distinguished by having its second pair of legs longest, the eyes subequal, the hinder row curved posteriorly. Supplement."

Micrommata marmorata is based on an adult female with a cocoon and is usually recognized as a synonym of *Micrommata undata* described on the preceding page. Mr. Emerton unfortunately placed the species in the genus *Ocyale* Audouin, (Lycosidae) and in 1898, Simon erected the genus *Pisaurina* for *Dolomedes mirus* Walck., (Ins. Apt., 1837, 1: 357, for Abbot's drawing pl. 65, fig. 321). This is usually recognized as the same as *undata* Hentz; so the species formerly known as *Pisaurina mira* (Walck.) with its many synonyms becomes *Dapanus mirus* (Walck.)

FAMILY THERIDIIDÆ

Genus Nesticus Thorell 1870*Nesticus cellulanus* (Oliv.)

Aranea cellulanus Olivier, Araignée, Encycl. Method., 1789, 4: 211.

Araneus cellulanus Clerck, Aranei suecici, 1757, p. 62, pl. 4, fig. 12.

Theridion terrestre Emerton, Psyche, 1924, 31:140, fig. 1. ♀

A female of this European house spider was found out of doors at Holliston by Mr. Emerton. Later a male was found in Nova Scotia and it was recognized then as the European species. The position of the genus is very uncertain. As it has a distinct comb on the fourth tarsus, it has been placed by many in the *Theridiidæ*, the only family with this character. But it also has a huge paracymbium, a character confined to the *Linyphiidæ* and the *Argiopidæ*. It does not make a round web.

Genus Conopistha Karsch 1881

The genus *Argyrodes* was established by Simon in 1864, in the first edition of the *Histoire Naturelle des Araignées*, p. 253, for a small species found about the Mediterranean. Unfortunately, the name has been used by Guenée in 1845, for a genus of Micro-Lepidoptera. In 1928, Strand published "Miscellanea nomenclatorica Zoologica et palaeontologica" in the *Arch. Naturgesch. Berlin*, 92, A. Heft 8, pp. 30-75 and proposed *Argyrodina* for *Argyrodes*. But Karsch, in 1881, (*Diagn. Japonicæ*, *Berliner ent. Zeitschr.*) erected the genus *Conopistha* for the Japanese species *bona-dea*, a new species. Later, Bösenberg and Strand placed this species in *Argyrodes*, (*Japanische Spinnen*, *Abd. Senckenb. Ges.*, 1906, 30: 129.). The name *Conopistha* has priority over *Argyrodina*.

The genus is very wide spread. The species are small, and both sexes are usually an iridescent silver. They live in the webs of larger spiders and catch small flies that escape the larger mesh. Two species of the genus are found in New England, *cancellatus* Hentz and *trigonus* Hentz.

FAMILY LINYPHIIDÆ

SUBFAMILY LOPHOCARENINÆ

Genus Floricomus Crosby and Bishop 1925

Floricomus emertoni nom. nov.

Histagonia nasuta Emerton, Trans. Conn. Acad., 1911, 16: 390, pl. 1, fig. 9, name preoccupied by Simon, Hist. Nat. Araignées, 1894, 1: 583.

Floricomus nasuta Bishop and Crosby, Journ. N. Y. Ent. Soc., 1935, 43: 33, figs. 7-11.

The genus *Histagonia* was based by Simon in 1894, on a small species found in Africa. In his preliminary remarks, he placed in the genus, a species to which he refers as *Pholcomma nasutum* Emerton. His use of the name *nasutum* was obviously a lapsus calami, although it was used four times, for the reference to the Trans. Conn. Acad., 1882, 6: 30, shows that he intended *Pholcomma rostratum* Emerton. This was overlooked by Emerton, when he described a new species in 1911 and again by Bishop and Crosby when they revised the genus *Floricomus* in 1935. I propose the name *emertoni* for *Histagonia nasuta* Emerton, 1911.

FAMILY ARGIOPIDÆ

SUBFAMILY ARANEINÆ

Genus Aranea Linneus 1758

Aranea juniperi (Emerton)

Epeira juniperi Emerton, Trans. Conn. Acad., 1884, 6: 313, pl. 34, fig. 6, pl. 36, figs. 14, 15, 16; *ibid.* 1909, 14: 200, pl. 5, fig. 1.

This species was described from a female found on an island in Portland Harbor, Maine. The male was not found until several years later. Mr. Emerton then figured the male and the first and second pairs of legs. Unfortunately, he confused the position of the spines on the femora and shows them as ventral, rather than prolateral. This in some genera is of minor importance, but the genus *Aranea*, (*Eperia*) is divided by the presence or absence of ventral spines on the anterior femora. *Aranea juniperi* has no ventral spines on

the anterior femora and has two spines on the patella of the palpus. The species is widely distributed from Maine to Florida and west to Missouri. As it is small, delicate in both form and color, it is easily overlooked and is not often found in collections.

FAMILY THOMISIDÆ

SUBFAMILY PHILODROMINÆ

Genus Thanatus C. Koch 1837

Thanatus peninsulanus Banks

Thanatus peninsulanus Banks, Proc. Cal. Acad., 1898, (3), 1:265, pl. 16, fig. 11; Gertsch, Amer. Mus. Nov., 1935, no. 792:25.

Thanatus coloradensis Emerton, Ent. News, 1918, 29:74.

Thanatus retentus Chamberlin, Pomona Coll. Journ. Ent. and Zool., 1919, 12:9, pl. 6, fig. 5.

In the fall of 1914, Mr. Emerton found this spider in a restaurant in Boston and identified it as *Thanatus coloradensis* Thorell. A few years ago, an adult male was found in the store room of a restaurant in Cambridge. It had evidently been introduced with boxes of fruit from southern California and as far as known, it never has been found out of doors in New England. The species has a wide distribution from southern California as far south as Peru, South America.

FAMILY CLUBIONIDÆ

SUBFAMILY CLUBIONINÆ

Genus Clubiona Latreille 1804

Clubiona bryantæ Gertsch

Clubiona bryantæ Gertsch, Amer. Mus. Nov.; 1941, no. 1148:16.

Clubiona agrestis Emerton, Psyche, 1924, 31: 144, fig. 6, nec *Clubiona? agrestis* Hentz, 1847.

I had intended to rename this species but Dr. Gertsch also discovered the error and has renamed it in a recent paper. The species is known only from the type specimens found at Holliston, Massachusetts and a pair from Conway,

Michigan. It probably is local and becomes adult early in the season. The two large hooks on the dorsal side of the tibia of the palpus are very characteristic.

SUBFAMILY MICARIINÆ

Genus Micaria Westring 1851

Micaria delicatula nom. nov.

Micaria aurata Bryant, Occ. Pap. Boston Soc. Nat. Hist. 1908, 7, no. 9 : 74, nec *Micaria aurata* (Canestrini), 1868, from Corsica.

Micaria aurata Gertsch, Amer. Mus. Nov., 1933, no. 637: 2, figs 4, 6.

Micaria aurata Kaston, Check-list of the Spiders of Connecticut, 1938, p. 194.

This brilliant spider was wrongly synonymized in the New England List of Spiders in 1908 and unfortunately later workers have continued the error. The original description of *Herpyllus auratus* Hentz is rather vague, but the brilliant color and the two pairs of lateral bars on the anterior half of the abdomen is emphasized. In the south, there is found a *Castianeira* with similar markings which probably is the spider that Hentz had, as the figure shows the head only slightly narrowed, a character found in *Castianeira*, rather than *Micaria* and no indication of an abdominal constriction that is usually found in *Micaria*.

Mr. Banks in his Catalogue, 1910, places *Herpyllus auratus* Hentz as a *Castianeira* and in 1913, Mr. Emerton wrote a brief description and figured the female and the male palpus, the female was from Staten Island, N. Y. and the male from Falls Church, Virginia. This he calls *Castianeira aurata* Banks, not Hentz. (Bull. Amer. Mus. Nat. Hist., 22 : 258).

Micaria aurata is a misidentification and therefore a new name is necessary. I propose for it *delicatula*. According to Kaston, it is found in Connecticut. The only adult male in the collection at the Museum of Comparative Zoölogy is from the Sand Spit, Cold Spring Harbor, Long Island, N. Y. It differs from *Micaria longipes* Emerton with which has been synonymized, by the longer and more slender tibia of the palpus and the brilliant coloring.

FAMILY SALTICIDÆ

SUBFAMILY HYLLINÆ

Genus Evarcha Simon 1902*Evarcha blanchardi* (Scopoli)*Aranea blanchardi* Scopoli, Ent. Carn., 1763, p. 402.*Attus hoyi* Peckham, Descr. New or Little Known Spiders of the Fam. Attidae. 1883, p. 7, fig. 5, ♂*Attus pini* id., ibid., p. 20, fig. 16, ♀*Hasarius hoyi* Emerton, Trans. Conn. Acad., 1890, 8: 243, pl. 21, fig. 2.*Pellenes hoyi* Peckham, Trans. Wisc. Acad., 1909, 16: 557, pl. 48, fig. 4.*Evarcha flammata* Berland and Fage, Arach. France, 1937, 6 : 1240, 1270, figs. 2015, 2022.

In the revision of the Arachnides de France, 1937, 6 : 1271, the authors in a footnote, mention that they have many specimens of this species from Georgia, Colorado and Oregon and that they are surprised that Peckham did not recognize and figure it in his last paper. Peckham did know it but he failed to identify it with the common European species. In fact, even in Europe, it has received many names, as the male and female are differently marked. Clerck, (1757), gave it two names, Scopoli called it *blanchardi*, Walckenaer, (1802 and 1805), added two more names, C. Koch, (1837) another, Hahn, (1831), still another, Simon, (1868) one more and Karsch, (1874) still another. It is found all over Europe and Siberia and here it is common from New England to Washington and south to Georgia. It also has been placed in several genera and in 1902, Simon erected the genus *Evarcha* for it.

SUBFAMILY PELLEININÆ

Genus Habronattus F.O.P. Cambridge 1901.*Habronattus*, F.O.P. Cambridge, Biol. Centr. Amer., 1901, 2: 241.*Pellenes*, Peckham, in part, nec Simon, Arach. France, 1876, 3: 90.

The genus *Pellenes* was established by Simon in 1876, for *Aranea tripunctata* Walckenaer and *Attus lapponicus*

Sundevall, both widely distributed species in Europe. Later, the first species was selected as the type of the genus.

Simon and Peckham exchanged specimens of the common species found in North America and France but Peckham did not recognize the genus *Pellenes* and he described most of the American species in the genus *Habrocestum* that he afterwards placed in the genus *Pellenes*. In 1900, he redescribed all the American species with the third leg longest under the genus *Pellenes*. A year later, F.O.P. Cambridge, who must have been familiar with the European species of *Pellenes*, erected the genus *Habronattus* for the species found in Central America that have the tarsus of the male palpus not elongate, but more or less circular and flattened, with the bulb also circular, with two processes, sometimes widely separated, the outer usually longer but both following the contour of the cavity; the posterior legs are very spinose and the third and fourth tibiæ have a small dorsal spine at the base. These characters are just opposite to the European species of *Pellenes*.

The genus *Pellenes* is described with the quadrangle of eyes a little wider behind, small eyes midway between first and third rows, anterior legs robust, third pair longest, posterior tibiæ always lacking a dorsal spine. In the European species, the palpus is elongate, bulb long, with the embolus arising from the prolateral margin about the middle and continuing on margin as a stout, heavy spine to the tip of the cavity. There are a few American species that have several characters in common with the European. They have a similar palpus, and the posterior tibiæ have no dorsal spine, but the first pair of legs is longer than the third pair and the patella is normal. *Pellenes peninsulanus* Emerton and *P. longimanus* Emerton belong to this group but neither have been found in New England.

The genus *Habronattus* has many species in America. Eight are known from New England. All have the third leg longest and several have modifications on the first and third pairs.

SUBFAMILY DENDRYPHANTINÆ

Genus Metaphidippus F.O.P. Cambridge 1901.

Metaphidippus, F.O.P. Cambridge, Biol. Centr. Amer., 1901, 2:262.

Dendryphantes Peckham, in part; Simon, 1903, in part, nec *Dendryphantes* C. L. Koch.

The genus *Dendryphantes* was based by C. L. Koch, (1837) on *Aranea pini* DeGeer, (*hastatus* Clerck), a common species in Central Europe. It is strikingly unlike the American species that have been placed in that genus. *Dendryphantes pini* has the cephalic portion of the carapace broad and swollen, the quadrangle of eyes plainly wider behind than in front, the second row of eyes nearer the first than the third row, the p.l.e. not on extreme margin of the carapace, pubescence of scales, three pairs of ventral spines on the first tibia, basal, median and distal, that are small and opposite, palpus with tibia and patella of about equal length, tibial apophysis slender, straight and parallel to the cymbium, embolus arises on prolateral side about one-quarter from the tip of the bulb, a long slender and slightly curved spine, almost half the length of the cymbium.

In 1901, F.O.P. Cambridge described the genus *Metaphidippus* basing it on the Mexican species *mandibulatus* and suggesting that the small species described by the Peckhams as *Dendryphantes* belonged to the genus. These have the lateral margins of the carapace almost parallel, certainly not swollen in the eye area, the quadrangle of eyes is the same width in front as behind, or in a few species only slightly wider behind, the second row of eyes is midway between the first and third rows, the p.l.e. is on the extreme margin of the carapace, pubescence of a few hairs, not scales, three pairs of ventral spines on the first tibia, restricted to the distal half or two-thirds, strong and not opposite, palpus with tibial apophysis a short, bent spur, embolus starts from the tip of the bulb, usually a broad, flat lobe, with lateral margins chitinized and prolonged in points beyond the middle area.

The genotype, *mandibulatus* has long, porrect mandibles in the male. Most of the American species have short, vertical mandibles in both male and female but the size and angle of the mandibles is a variable character among other genera of the *Salticidæ*. All eastern species of the genus have no spines on the anterior patellae.

At the same time, F.O.P. Cambridge erected another genus, *Paraphidippus* and suggested that *Attus marginatus*

Walckenaer, (*militaris* Hentz), belonged there. It is evident that he had never seen the species and knew it only from the description given by the Peckhams, although it has been reported from Mexico. In 1909, Peckham in his "Attidae of North America", places it in the genus *Dendryphantes*. It is not a true *Metaphidippus* as the small eyes are nearer the first than the third row, but it has more characters in common with *Metaphidippus* than with *Paraphidippus*.

Eight species of *Metaphidippus* have been found in New England. Probably the commonest is *Metaphidippus capitatus* (Hentz). The synonymy of this species is very unsatisfactory. A few of the names are given.

Attus capitatus Hentz, 1845, 5 : 200, pl. 17, fig. 15; reprint, p. 51, pl. 7, fig. 15.

Attus aestivalis Peckham, 1883, p. 2, fig. 2.

Icius crassiventer Keyserling, Verh. z. b. Ges. Wien, 1884, 34 : 503, pl. 13, fig. 11.

Dendryphantes aestivalis Emerton, Trans. Conn. Acad., 1891, 8 : 228, pl. 17, fig. 2.

Dendryphantes capitatus Peckham, Trans. Wisc. Acad., 1909, 16 : 469, pl. 36, fig. 4, pl. 38, fig. 5.

Hentz described *capitatus* from a single male collected in Georgia and on the plate, he failed to place a line next the figure to indicate the length, so it can be inferred that the drawing is the natural size. If this inference is correct, *capitatus* is probably a *Phidippus* and not found in New England as all the specimens found here are small. However, the male and female are marked differently and Hentz described several other species that are common in the south that would agree very well with the females collected in New England.

Attus aestivalis is described by the Peckhams, from a pair collected in Pennsylvania. Unfortunately the types are missing from the Peckham Collection in the Museum of Comparative Zoology, and neither can be found in the collection any specimens named by them. The figure of the palpus shows two dark, sinuous processes at the tip of the bulb but the processes are not connected. The figure of the epigynum is also rather indefinite, but the description states a "rounded opening at the posterior edge". The length of the

lateral margins on the embolus and the shape of the opening of the epigynum are of specific importance.

The type of *Icius crassiventer* Keyserling is a female, from Massachusetts and is in the museum collection. It agrees with what has been called *Dendryphantes capitatus*.

SUBFAMILY SITTICINÆ

Genus Sitticus Simon 1901

Sitticus pubescens (Fabr.) (Fig. 2)

Attus pubescens Fabricius, Syst. Ent., 1775, p. 438.

Sitticus pubescens Berland and Fage, Arach. France, 1937, 6 : 1186, 1255, figs. 1869, 1871.

Male. Length, 4.8 mm., ceph. 2.2 mm., abd. 2.0 mm.

Cephalothorax a very dark brown, cephalic portion with scattered short, white hairs most numerous about p.l.e. and forming a white spot about the middle of the eye area, cephalic portion high, ending a short distance posterior to the third eye row with a shallow depression, eye area flat, thoracic groove short and deep, thoracic portion much longer and wider than cephalic, with rounded sides, in about the same plane as the cephalic until the posterior third when it slopes rapidly to the margin; *eye* area about two-fifths the length of the cephalothorax, wider in front, anterior row of eyes strongly recurved, eyes equidistant, row of long hairs above a.m.e., eyes of second row nearer first than third row, third row not as wide as cephalothorax and eyes smaller than a.l.e.; *clypeus* below a.m.e. about a radius of a.m.e.; *mandibles* rather small, vertical, flat in front, fang groove slightly oblique with four subequal teeth closely grouped on superior margin, inferior margin not defined but an oblique row of bristles from base of fang to median margin, fang with a wide base and evenly curved; *sternum* dark brown with white hairs about posterior margin, convex, anteriorly little wider than labium, fourth coxæ almost touching; *abdomen* dark brown thickly covered with white and faun-colored hairs arranged in no definite pattern, venter paler; *legs*, 4-1-2-3, yellowish-brown with many short white hairs, femora clouded with dark brown, anterior tibiæ with broken basal and distal dark rings, tips of tarsi dark, all joints of

fourth leg longer than corresponding joints of first leg; spines, no spines on patellæ, I pair, tibia, ventral, 2-2-2, lateral, 0, metatarsus, ventral, 2-2, lateral, 0; *palpus* dark, terminal joint thickly covered with long, coarse hairs, femur curved at base and laterally compressed, seen from above,

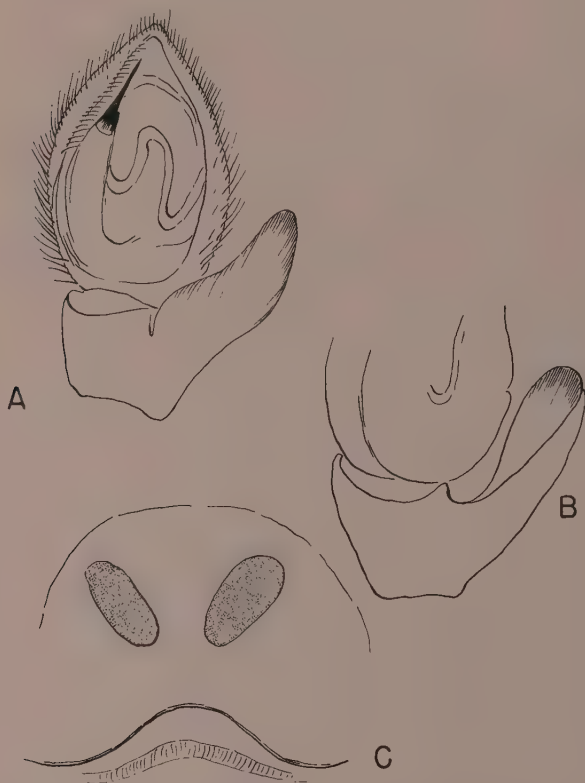


Figure 2. *Sitticus pubescens* (Fabr.). A, ventral view of palpus; B, tibial apophysis; C, epigynum.

patella and tibia subequal, tibial apophysis a large spoon-shaped lobe, longer than diameter of the joint, starting from the base of the joint and directed forward and slightly outward, not pressed against the tarsus and almost reaching the middle of that joint, on opposite side of the tibia a row of

long black hairs, cavity extends length of the cymbium and filled with the palpal organ, bulb divided longitudinally, larger half shows duct of two loops in upper portion, smaller half with the rather short, straight embolus that starts at distal end with a short tooth near origin and tip near the end of cavity.

Female. Length, 4.9 mm., ceph. 2.0 mm., abd. 3.0 mm.

Cephalothorax dark brown, eye area black with a sparse covering of short white hairs, no median white spot as in the male but the same fringe of long black hairs above a.m.e., thoracic groove wanting; eyes, anterior row not as strongly recurved as in the male; mandibles, superior margin with five teeth, no oblique row of bristles on inferior margin as in the male; abdomen black with white and faun-colored hairs forming a pair of large white spots about the middle, followed by three pairs of very small dots, venter paler; legs and spines same as in male; epigynum, margin of fold distinctly notched and at some distance above, a pair of black oblique oval sacs beneath the skin.

♂ ♀ Massachusetts; Allston, 14 July 1932.

♂ ♀ Massachusetts; Allston in house, 15 July 1934.

This species is found throughout Europe and according to modern authors, it is subject to variations in color pattern and shape of the tibial apophysis of the male palpus and even the longitudinal division in the palpal organ. The museum collection has a male from the Paris Museum and a pair from the Peckham Collection, probably received from Simon. The male from the Paris Museum has the same large spoon-shaped tibial apophysis, the palpal organ with the longitudinal division but the embolus is half hidden, so that it is impossible to see if it has a tooth near its origin. The superior margin of the fang groove has three unequal teeth as figured by Simon in the *Histoire Naturelle des Araignées*, 2 :578, fig. 699; figure 700 on the same page shows the large spoon shaped tibial apophysis but the embolus is a long slender tube, starting on the margin about the middle on the same side as the apophysis, (retrolateral), something that is not mentioned in any description of the species. According to Simon and Reimoser, it has received several names, which is not surprising from the variations

in marking and habitat. Simon states in *Arachindes de France*, 1876, 3 : 108, "Commun dans toute l'Europe; il se trouve ordinairement sur les murailles exposées au soleil, même dans l'intérieure des villes".

A pair was found on a brick wall in the sun on a very hot morning in July 1932. Two years later on almost the same date, a pair was taken inside the house jumping on a window screen. In movements, it suggests *Salticus scenicus*.

THE LEPIDOPTERA OF THE DRY TORTUGAS

BY WM. T. M. FORBES

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The Dry Tortugas occupy an unique space in the geography of the United States, being the only "Oceanic" Islands in the Gulf of Mexico. In a sense they would belong to the Florida Keys, being a continuation of the same formation, but they lie so far beyond Key West (75 miles) that casual immigration would be limited to the stronger flyers; moreover, they are so low that they most probably have been completely under water since the last glacial period. Presumably the whole fauna has come in by sporadic accidents during the last few thousand years. Naturally most of the species of the list are wide-spread, being found both on the Mainland and in Cuba, but the *Litoprosopus* may possibly be endemic,—in any case it is more like the Bahaman *L. bahamensis* Hmps. than the Florida *L. futilis*.

I owe the material to the kindness of Prof. H. H. Plough of Amherst College, who collected it in the summer of 1936. I have not noted any other records of Lepidoptera from the Islands.

LIST

Pieris monuste. Both phases of the female were taken, but not extreme.

Nathalis iole. Garden Key.

Thecla columella. Apparently the commonest butterfly to judge by the number taken by sweeping.

Plebeius filenus (*hanno*). This is the *filenus* of Bates' "Butterflies of Cuba" and the *hanno* of most U. S. collectors. Holland figures something else (which I do not know) as *filenus* from Florida. In any case the Tortugas specimens are like those from the Antilles and the commoner form from Florida.

P. ammon. A single specimen.

Lerodea eufala.

Prenes panoquinoides.

Herse cingulata.

Syntomeida epilais. Larva on oleander. I have no records of this species for the Antilles, though it ranges south to Honduras on the Mainland. These specimens are like ours from Florida.

Peridroma margaritosa.

Mocis latipes.

Anticarsia gemmatilis. These three Noctuids are typical wanderers, with tremendous ranges.

Litoprosopus bahamensis Hampson. A single specimen, damaged by ants, is indistinguishable from *bahamensis*; but is decidedly colder brown, and with a much paler hind wing than true *L. futilis* from Florida. The large Texas species that passes for *futilis* appears to be undescribed, and matches this specimen much more closely in color. New to the U. S.

Synchlora aerata. Two specimens seem definitely to be this and not the common Antillean *S. frondaria*.

Cosymbia myrtaria form *triseriata* Prout. This species is discussed by Prout in the *Macrolepidoptera of the World*, viii, 96 (pl. 12, fig. d6) but is not distinguished in McDunnough's Checklist, where "myrtaria" includes this, the more familiar northern *packardi* Prt. and the endemic *benjamini* Prt. from Florida. The single female is damaged, but I think is this, which Prout reports from both Florida and San Domingo.

Camptogramma stellata.

Microgonia peosinata Guenee. One female, which is surely this. It also occurs in Florida, though it is not in our lists.

Hymenia perspectalis.

Ercta vittata Fabricius. New to the U. S. I found it abundant in Porto Rico.

Sameodes cambogialis Guenée (*citrinalis* Möschler). New to the U. S. *S. citrinalis* Hmps. is a distinct species.

Pyrausta tyralis.

Trichoptilus defectalis.

Undetermined micros. represent the Crambinae, Phycitinae, Phaloniidae and Blastobasidae.

DESCRIPTIONS OF SOME NEW SPECIES OF
SYRPHIDÆ

BY FRANK M. HULL

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This paper is a continuation of studies begun several years ago on the Syrphid flies in the collections of the Museum of Comparative Zoology, which I have been privileged to study through the courtesy of Professor Nathan Banks. In the paper are included notes and descriptions of recent additions to this large collection.

Syrphus melanostomoides n. sp.

Male. Length 9.5 mm.

Head: eyes touch for length of vertical triangle. Vertex, front and face dark shining black or brownish, the front above the shining bare callosity over the antennæ brownish pollinose. The face, except for the shining tubercle and a narrow stripe running upward to the antennæ, pale brownish, white pollinose. Cheeks and edge of oral margin, except in front, brownish yellow to fulvous. Tubercle of face rather prominent with considerable concavity below the antennæ. Pile of vertex and front black. Pile on upper face dark, on lower face white. Occipital pile white up to angle of excavation. Antennæ short, entirely black; first and second joints subequal, third not quite as long as first two combined. Arista thickened on basal four-fifths, bare. Eye facets slightly enlarged. *Thorax*: dark shining brown or black, rather convex on the dorsum; pile quite long, sparse, very slender, dark in color. Pile on scutellum similar but even longer. Ventrally directed fringe of pile on scutellar margin pale colored. Mesopleuræ and an area on the dorsal suture with a band of conspicuous yellow pollen, which is pale pilose. Halteres and squamæ light brown; lower lobe bare. Humeri and metasternum bare. *Abdo-*

men: black, obscurely shining. First segment metallic, the segment with a small semicircular yellow brown spot, its round side directed medianly, outer side straight. Third and fourth segments similar but with larger spots, except those on the third are more nearly triangular and the rounded angles again are medial, but the greatest length of the spot is vertically arranged on the segment; the spot on the fourth segment in contrast to the third, is placed transversely, but is angular—the angle placed medially. None of the spots touch the sides, and all are widely interrupted. The spots of the second segment may be wanting and on the fifth segment there may be more traces of yellow. Pile of abdomen long on the sides, pale in color, almost wanting on the surface but the surface is thickly beset with black, appressed, very short hair or bristles. Sides of abdomen parallel, much inrolled. *Legs*: black, tarsi very dark brown, extreme base of fore tarsi and apex of femora light brown. *Wings*: pale brown, stigma darker.

Female. Length 9 mm. Front shining black, on the lower part brown pollinose, with a faint median groove. Long pile of abdomen, thorax and scutellum wanting. Abdominal spots apparently wanting.

Eleven males from Tjibodas, Mt. Gede, Java, 9,000 ft. (Bryant and Palmer); one male, Seliban River, Mt. Apo, Mindanao, Sept. 17, C. S. Clagg). I place here provisionally, two females, Pangrango Mt. Java, 9000 ft. (Bryant and Palmer). Type and paratypes in Museum of Comparative Zoology. Paratypes also in the author's collection.

***Baccha banksi* n. sp. (Plate 10, Fig. 4)**

Male. Length 10-12 mm.

Head: eyes touch for more than the length of antennæ. Vertical triangle a very acute triangle, rather convex, anteriorly opaque black, shining posteriorly. Ocelli crowded into anterior part. Eyes cut away behind the vertex leaving the occiput at mid-vertex and on either side unusually thick. Pile in the midline of vertex thick, short, black, but immediately on either side becoming longer and white. Front rather convex; pile short, sparse, black. Antennæ quite short, third joint rounded, all of a brownish yellow color. Arista

darker, basally thickened. Facial tubercle fairly prominent, quite pointed; it and a widening stripe upward to antennæ shining black. A large triangular spot or callosity above antennæ, enclosing on each side a small yellow spot, shining black. Remainder of face and cheeks bright shining yellow, with a trace of white pile on the former. Mid occipital excision large and conspicuous. *Thorax*: black, moderately shining with suggestions of four narrow brown pollinose vittæ. *Pleuræ* vitreous black with sharp, pale yellow spots continued as a narrower stripe on the dorsal suture. Scutellum pale yellow, dully shining, narrowly black in the corners. Pile of dorsum erect, microscopically short, except for the anterior collar of pile. No ventral scutellar fringe. *Abdomen*: slender and elongate, terminal segments two and one-half times as wide as second. The second segment scarcely constricted anywhere; six times as long as wide. First segment black, its sides basally yellow. A suggestion of a small brown spot on the black second segment on each side of the middle. Remaining segments dark brown or black, shining, with yellow brown marks; on the third, on either side, a wide acute V, its sides thick, its ends sharp. On the fourth segment a long slender vertical spot near the midline on either side and lateral to this a shorter anteriorly placed, elongate spot. Posterior margin of fifth segment yellowish brown. Hypopygium long, nodular, rounded at tip. Abdomen thickly, short, black, bristle-covered. Abdomen larger than wings. *Legs*: coxæ and trochanters brown, femora black to brown, with apices narrowly yellow. Fore tibiæ dark brown, apices and base yellow; mid and hind tibiæ entirely dark, except basal third which is yellow. Tarsi brown, fore and mid basitarsi yellow. Pile of legs short, black. Mid femora slightly thicker than post femora. *Wings*: hyaline, whole marginal cell brown, whole costal cell yellow.

Female. Quite similar to male. Costal cell brown. Black of the face ascends to vertex, leaving each side of front narrowly yellow.

One male and one female, Bella Vista, Panama (Nathan Banks). Type male, in the collection of the Museum of Comparative Zoology. Paratype female in the collection of the author.

This species traces to *B. brevipennis* Schiner in Dr. Curran's key.

Chrysogaster gewgaw n. sp. (Plate 10, Fig. 11)

A small species obviously related to *Chrysogaster shannoni* Cur. and to *C. neotropica* Shannon. Characterized by its yellow tibia and basal two tarsal joints and glittering greenish silver color with its four copper stripes on the thorax. The third antennal joint is shorter than in *shannoni*, the front not so long, besides other differences. The wing picture, eye maculation and yellow tibiæ distinguish it from *neotropica*.

Male. Length 4 mm.

Head: eyes actually touching for a very short distance, but appear to be contiguous for the length of the vertical triangle, or length of second antennal joint. Vertical triangle considerably elevated, slightly longer than wide. Front short, not as long as second joint of antennæ, deep coppery brown, greatly pitted and rugose. The rugæ continue to be prominent and transverse on the sides of the shining coppery face, except that there is a vertical smooth unwrinkled band running from below antennæ to the base of the oral prominence. Oral margin in front produced as a small rounded knob, excavated deeply and sharply above; in this respect it must resemble *shannoni* Curran. Eyes marked with two vertical bands, looped and folded in a way suggesting a bow-knot. Occipital rim or margin very narrow, practically absent. Cheeks narrow. Antennæ light yellow, dark brown on the third joint just past arista. Arista pale, extremely delicate, basally thickened and reaching just past third joint. First joint not half as long as second; second and third joint subequal. Pile of face sparse, quite short, pale, inconspicuous. *Thorax*: rich, coppery, finely rugose with four prominent dark brown vittæ and traces of another on each outer margin. Scutellum coppery, finely punctate or wrinkled, its rim faintly impressed, its edge rounded but slightly squared. Pleuræ coppery. Halteres pale brown. *Abdomen*: disk of abdomen dull shining brown. Sides of abdomen (and the hypopygium especially so) glittering, brassy in color. *Legs*: all the femora, except their narrow

yellow apices, glittering brassy in color. Tibiæ and tarsi, except the last three tarsal joints, pale yellow. *Wings*: with brown spots in the cross veins, in the middle of the marginal cell, middle of first posterior cell, tip of third longitudinal vein and a prominent cross band running down the wing from the termination of second longitudinal vein.

Two males, Soledad, Cuba, May 24, 1925 (George Salt). Type in the Museum of Comparative Zoology.

***Lathyrophthalmus obtusus* n. sp.**

Male. Length 10 mm.

Head: upper facets enlarged, touching for twice the width of the vertical triangle, the latter nearly equilateral, much elevated. The ocelli standing out conspicuously. Front gently convex, dark brassy brown, with yellow-grey pollen, bare in the center. Antennæ situated about the middle of head, entirely light brown. Arista similarly colored, bare, two and one-half times length of third joint. Face with a small oval knob, bare, gently concave below antennæ, brassy black in color, densely yellow pollinose. Cheeks shining and bare, except for a narrow pollinose stripe. Spots of eyes small, two to three times as far apart as wide, clustered into an obscure horizontal band about the middle. *Thorax*: brilliant brassy or coppery with four yellow pollinose vittæ and a fifth exceeding narrow medially, the three central ones connecting with a transverse band before scutellum. Scutellum shining, varying from light yellowish brown on its rim to dark at base. Pile of thorax and scutellum upright; long, yellowish and black hairs intermixed. Pleuræ bears a conspicuous diagonal stripe, pollinose, from before wing toward fore coxæ and a spot high above mid coxæ. *Abdomen*: opaque black, first segment brownish yellow, blackish in middle and narrowly on posterior edge. Second segment with two large yellow spots on basal edge, their hind borders convex and meeting centrally. Posterior border narrowly shining. Third segment and fourth with narrow diagonal yellow pollinose stripes not interrupted; posterior borders and lateral margins of these segments widely shining to metallic. *Legs*: femora shining black with apices narrowly yellow. Tibiæ and tarsi light yellow, distal ends of tibiæ

dark brown, mid tibiæ less so, hind tibiæ entirely dark brown except the narrow base. Tarsi yellow except last three black joints of hind tarsi. *Wings*: hyaline, stigma cream colored, brown at either end.

Three males. Buitzenborg, Java (Bryant and Palmer). Type in the Museum of Comparative Zoology.

Psuedovolucella apimima n. sp. (Plate 10, Fig. 5)

Male. Length 14 mm.

Head: eyes touch for distance equal width of posterior ocelli. Front very short, with narrow median groove or line. Head and face produced deeply but very flat and not produced forward. Antennal prominence inconspicuous. Front and face and cheeks light pale brown, pale yellow pollinose, except for bare shining obtuse facial knob and pollinose, darker strips between cheeks and face. Antennæ brown, third joint half again as long as wide. Arista twice as long as third joint, densely plumose, pale brown, its rays long, forty to forty-two above. Eyes bare. *Thorax*: dull brown, obscurely shining, with exceptionally narrow whitish pollinose streaks on the suture. Pile thick, erect, pale, growing bushy on the pleuræ. Scutellum reddish yellow to brown, with bushy, dense, long, yellow pile. Squamæ and pleuræ light brown. *Abdomen*: light brown on first, second segments and dark blackish on the third and fourth, a brown band formed as two slender wedges on the second segment whose points meet medially and a convex brown band on the base of the same segment. On the third segment a single, uninterrupted, yellowish-brown band, narrowly reaching the sides, widest in the middle and placed on the anterior half of the segment. Pile of abdomen very short, appressed, yellow and longer on the base of the abdomen, bushy on the basal corners, yellow on the light bands, black with some yellow hairs on the dark portions. Hypopygium with scattered, long, black bristles. *Legs*: light brown, the hind femora much darker on the outer half. Pile of legs light in color, but sides of hind femora outwardly bear numerous, short, black bristles. Hind femora strongly thickened, greatest past middle, an accentuated concavity ventrally, due to a terminal knob. Hind tibiæ basally with a small

blunt knob. *Wings*: tinged with pale brown, darker about the stigma.

One male. Tjibodas, Mt. Gede, Java, 7800 ft., 1909 (Bryant and Palmer). Type in the Museum of Comparative Zoology.

A very remarkable resemblance to *Eristalis tenax* and to a honey bee. It is certainly very close to Shiraki's species *mimica*. Nevertheless, it appears to me that the hind femora of *apimima* are more strongly thickened and incrassate and that the arista has some forty dorsal bristles to twenty-four or twenty-five in *mimica*, judging by Shiraki's figure.

***Volucella nitidithorax* n. sp.**

A large shining black species with yellowish brown face and yellow tinted wings. It belongs to the *V. nigricans* group.

Male. Length 18.5 mm.

Head: eyes densely black hairy, the black pile of the vertex twice the length that of the eyes, fine and bristly. Front protuberant, small, black bristly. Antennæ and thick plumose arista orange brown, the third joint small, short, barely longer than broad and tapering quickly to a rounded point. The face has the appearance of being dark shining brown with a wide, shining, brownish-yellow middle stripe from base of antennæ to oral margin. Yellow stripe covered with numerous fine black bristles interspersed in which are a few pale ones, all beginning just above the tubercle. The tubercle or knob is prominent but flat, leaving the face deeply excavated below the antennæ. Occiput black, black pruinose, with very short black pile. *Thorax*: and scutellum shining black, covered on the former with very dense, erect, fine black, bristly hair. There are some quite long black bristles on the upper pteropleuræ, sides of thorax and scutellum. Humeri dark brown. *Abdomen*: dorsally and ventrally shining black, covered with thick, short, black bristles, quite appressed, a little longer on fourth and fifth segment. *Legs*: entirely black, black pilose. Hind femora quite slender. *Wings*: suffused with yellow. More prominent on the veins and brownish along the posterior terminations of the veins.

One specimen, Mt. Apo, Mindanao, Phillipine Islands,

Mainit River, 6500 ft., Oct. 27 (C. F. Clagg collector). Type in the Museum of Comparative Zoology.

***Volucella pallidithorax* n. sp. (Plate 1, Fig. 8)**

Female. Length 12 mm.

Head: face descending into a slender cone, quite pointed at apex. The tubercle prominent, leaving a concavity below antennæ but apart from the tubercle the profile of the face from antennal base to tip of epistoma is almost perpendicular. Front not wide; nowhere wider than length of third antennal joint, at vertex over three times the width of ocellar tubercle; the ocelli very small and close set. Head everywhere, except the posterior occiput, post vertex and above the cheeks, pale shining yellow. Antennæ entirely orange brown. Arisal rays long and loose, twenty-one to twenty-two above. Pile of eyes not half as high as vertical pile, the former pale, the latter black, merging into the long, pale, upright pile of lower front. Pile of face short, appressed, sparse, golden. *Thorax*: pale greenish yellow, a brown pair of stripes medially, stopping well before the scutellum, an outer pair black, interrupted at suture, pointed posteriorly, nearly reaching the scutellum. Pleuræ and scutellum pale yellow, the latter translucent with four very long, black bristles on either side not arising from noticeable tubercles. Four similar bristles on posterior calli, one on mesopleuræ and four on sides of mesonotum. *Abdomen*: pale yellow, translucent, a narrow black border posteriorly on the second segment, wider at the angles, with a suggestion of a narrow median streak. There is a wider similar border on the third, with a median black prolongation that reaches the anterior margin of the segment. The fourth segment marked much as the third. The yellow of the third reaches the margin very narrowly but on the fourth reaches the margin in full width; pile of yellow areas yellow, of black areas black. *Legs*: yellow, the bases of all of the femora, distal fourth of the fore and mid tibiæ and greater part of hind tibiæ and all its tarsi black. *Wings*: with a yellowish tinge.

One female. Honduras, Rosario Mires. Type in the Museum of Comparative Zoology.

Related to *V. prescutellaris* but the front is yellow, not

black, and is partly black pilose. The abdominal segments differ.

***Phalacromyia bipunctata* n. sp.**

Male. Length 8 mm.

Head: eyes with upper facets enlarged, contiguous for twice the length of the second antennal joint, densely pale yellow pilose, their pile almost as long as depth of third antennal joint. Antennæ pale orange brown, the third joint at least twice as long as wide, rounded at the tip with a slight indication of a dorsal excavation. Arista yellowish with darkened apex and thirteen to fourteen bristles dorsally. Face and cheeks entirely pale shining yellow, the knob small and evenly rounded with a number of short yellow bristles and some longer yellow hair on the sides of the face near the middle. Occiput yellow, yellow pilose. *Thorax*: dorsum shining light yellow with faint indications of darker vittæ, the long, thick, erect pile and the lateral and scutellar bristles all golden yellow. Scutellum with a small brown spot on either side of the flat depression, the basal roughened areas slightly wider than long. Pleuræ yellow translucent. *Abdomen*: upon the base pale translucent, yellowish brown as far as the middle of third segment where the posterior edge of the light coloration is trilunate. Remainder of abdomen shining brownish or blackish. *Legs*: all the femora pale brownish yellow except narrowly at the tips, the tibiæ brownish, darker apically and the tarsi brownish. *Wings*: and stigma except a tiny brown spot at the base tinged with greenish yellow.

Female. Similar, a faintly suggested brown stripe on cheeks, a lunate depression in the middle of the shining yellow front. There is also a suggestion of brown at each basal corner of the scutellum where there is a rugose depression suggesting *Volucella chalybescens*. Abdomen subtranslucent greenish beyond the middle of the second segment. Tibiæ and tarsi somewhat more blackish.

Several specimens, Pastorea, Paraguay, Jan. 1922 (Donald Wees collector). Type, male, allotype female and paratype in the collection of the Museum of Comparative Zoology; three paratypes in the author's collection.

This species is very similar to Curran's species *circe* but is distinct I believe, in the different maculation of scutellum and abdomen.

Graptomyza flavorhyncha n. sp. (Plate 10, Fig. 6, 7, 9)

Male. Length 6.5 mm.

Head: sides of face and front parallel. Upper half of front and vertex shining black with a gentle concavity on the former marked by a lunulate depression on either side. Front above antennæ pale yellow. Cone of face long and slender, acute, marked by a narrow shining brown median stripe reaching antennal base; cheeks shining brown. Remainder of face shining pale yellow, vitreous. First and second joint of antennæ very short, third very long, flattened, tapering quickly from apex to a dorsal point, its upper margin narrowly brown. Remainder of antennæ light orange brown. Arista slender, long, short pilose, black on apical half, yellow basally. *Thorax*: and pleuræ shining dark brown. Humeri and the front of thorax to and including coxæ, a dorsally confluent spot on anterior mesopleuræ in front of wing, lateral calli and a thoracic band before scutellum light yellow. Pile very short, erect, sparse, pale.

Scutellum light brown, darker apically, with a curious and perfect oval depression lying transversely, its rim posteriorly short pilose, the margin of the scutellum with a few long black bristles, similar to others on post calli and sides of thorax. Halteres and squamæ yellow. *Abdomen*: light brownish yellow, subtranslucent, with a wide but dorsally invisible black, continuous, lateral margin. The following black markings occur on the abdomen: the apical border bands on the second and third segments, the anterior edges of which are trimammillate, a median wedge and a posterior point on the fourth segment, together with a rounded dash-like spot on either side of this segment. First segment wholly yellow. Abdomen very convex. *Legs*: light brown, the narrow base of all femora, apical half of fore tibiæ, median band of mid and hind tibiæ and fore and mid tarsi black. Hind basitarsi simple. *Wings*: uniformly yellowish brown. No spurs.

One male, Mainit River, Mt. Apo, Mindanao, Phillipine

Islands, 6000 ft., Sept. 14 (C. S. Clagg). Type in the Museum of Comparative Zoology.

***Graptomyza setigloba* n. sp. (Plate 10, Fig. 10)**

Male. Length 6.5 mm.

Head: vertex and front polished, vitreous blue black, the latter with a semicircular crease or depression on each side, the convex edge of which it turned to the mid-line. Just above the antennæ the face, also vitreous, becomes light-brownish yellow and this is the color of all the remainder of the face and cheeks. Face descending into a long pointed cone, covered with a very few long pale bristles. Pile of occiput and front pale; of the vertex black. Eyes with very sparse pale pile. Antennæ, except for a narrow dorsal black band, entirely brownish yellow to yellowish orange outwardly. Arista long and slender, pale colored, ten rayed, the rays on the outer half only. The third joint is very long and broad and flat. It is pendulous and practically descends to the lowest level of the eyes. The apical bristles of second and third joints black. Occiput excavated, its margin not visible from lateral profile. *Thorax*: shining bluish black on the central dorsum, the humeri, suture, calli and the scutellum, except its brown central ellipsoidal depression, all shining clay yellow or brown. Pile of thorax and scutellum pale brassy, the bristles black. *Abdomen*: pale subtranslucent yellowish brown, marked with black. On the posterior border of the second segment there is a black triangle, the base on the border, the three angles of which are extended somewhat as narrow lines, the two antero-lateral faces of the triangle quite concave. Third and fourth segments largely black, the narrow anterior portions of these segments pale and the black of the third segment nearly meeting the second segment medially, but obtusely rounded off. The lateral margins of second, third and fourth segments narrowly black. Whole abdomen unusually globose. The bristles thick, semi-decumbent and black in color. Some short, pale pile on the basal half of second, third and fourth segments and the ventrally directed lateral fringe of pile is pale. *Legs*: brown, the femora and tibiæ pale yellowish

brown, the bases of the former and the tarsi very dark brown to black. *Wings*: pale yellowish. Stigma brown.

Two males, Mt. Apo, Mainit River, Phillipine Islands, 6000 ft., Sept. (C. S. Clagg). Type in the Museum of Comparative Zoology. Paratype in the author's collection.

***Microdon aurigaster* n. sp.**

Male. Length 9.5 mm.

Head: entire insect, except antennæ, tibiæ and tarsi, dark shining brown, nowhere blackish. Antennæ light orange brown, elongate, third joint a bit longer than first and three times length of second. Arista short, concolorous, quite thickened at base; no pedicel. Vertex somewhat swollen, its pile, that of front and face depressed and golden and rather long. Face broad, transversely rugose and grossly punctate. Eyes sparse, short, pale pilose. *Thorax*: whole dorsum short, thick, greatly appressed golden pilose, visible only from the right angle, but with bands standing out at other angles as a transverse sutural band and a prescutellar band. Of these bands, only one-half (the right or left half) may be seen at one time. Scutellum short, inconspicuously golden pilose, with two small close set spines. Squamæ and halteres brown, the former with a golden fringe. *Abdomen*: apical corner of second abdominal segment, side margins of third, its narrow posterior margin and the whole of the fused remainder brilliant golden pilose, the pile much appressed and set as if it were flowing on each side in diagonal and opposed directions. *Legs*: pile of femora pale, the surface of hind femora deeply and grossly punctate. The tibiæ and tarsi light orange brown, remarkably densely covered (for tibiæ) with long golden bristles. Hind tibiæ in the middle and the thickened hind femora basally with diagonal cicatrices. *Wings*: on basal anterior border cream yellow, posteriorly grey; the yellow continuous apically, to bend down as a yellow spot towards the tip where on either side the wing (basally and apically) is a little darker grey; wing else where light grey. A spur is present from third longitudinal vein but nowhere else. The terminal section of the fourth longitudinal vein forms a most pronounced and prominent outward bulge.

One male, Bolivia, Province Sara (Steinbach). Type in the Museum of Comparative Zoology.

***Eumerus ergator* n. sp. (Plate 10, Fig. 3)**

Allied to *Eumerus deceptor* Cur. from which it is separated by the yellow colored pile of the front instead of white and the snow white, white-pilose terminal hind tarsi, besides minor differences. Like *deceptor* the scutellum is obtusely dentate.

Male. Length 11 mm.

Head: front and vertex quite rounded. Eyes almost touching at a point just below ocelli, escaping it by a distance equal to that between the upper ocelli. Face gently receding below antennæ, faintly concave. Cheeks narrow. Color everywhere shining brassy brown and everywhere, including eyes, very densely long yellow pilose but not golden. Antennæ light yellow. First joint very short, second twice as long, third large and evenly rounded, as long as broad. Arista yellow at base, thickened, blackish apically. Sides of the face parallel, slightly wider about oral margin. The aspect of the head strongly suggests a species of *Pipiza*. *Thorax*: pleuræ, scutellum and abdomen everywhere brilliant brassy and clothed with long, nearly erect, brassy pile. *Abdomen*: sides of abdomen and apex slightly copper. Sides of segment, with small, postero-lateral, inwardly pointed, yellow pollinose spots lying in a conspicuous trench or concavity. Third segment with larger similarly colored spots, directed obliquely forward to median line but widely separated and with straight median edges. Fourth segment without such pollinose spots but with a coppery impression still more obliquely directed, lying on each side. *Legs*: femora and basal two-thirds of hind tibiæ dark, golden brown with brassy pile; base of hind tibiæ, remainder of tibiæ and tarsi, except for the apical three tarsal joints of mid and hind tarsi, varying shades of light yellowish brown. The apical three joints of mid and hind tarsi are snow white with snow white pile. Hind apical tarsi without any dilatation suggestive of *E. peltatus* Meijere. *Wings*: uniformly pale brownish. Sub-apical cross vein remarkably angulated, both an-

gulations spurred. Angle of distal cell quite obtuse. Spurious vein not prominent.

One male, Mt. Apo, Mindanas, Phillipine Islands, Mainit River, 6,500 ft. Oct. 23 (C. L. Clagg). Type in the Museum of Comparative Zoology.

Cerioides delicatula n. sp. (Plate 10, Fig. 1 and 2)

This is very similar to *Cerioides bezzi* from which it differs in the longer abdominal pedicel, abbreviated yellow band on posterior border of third segment, slightly longer antennæ, annulate hind femora and other minor differences. It traces to *bezzii* in Curran's key to the genus.

Female. Length 13 mm. including antennæ.

Head: front and face and vertex black, marked with yellow and punctate. On either side of vertex there is a small spot connecting each eye corner with the occiput, a narrow longitudinal stripe beginning just below the ocelli, two diagonal ones just above antennæ, two lunate spots on either side of antennæ, a slightly larger spot below this one and between the latter are two diagonal spots which fall just beneath the antennæ. Finally there are four short facial stripes, the inner two running diagonally from the direction of antennæ and converging to a point above oral margin, the outer two diagonally running from eye margin to lowest point of oral margin. The cheeks are yellow, interrupted by a brown triangle. The yellow face markings may be bordered by brown. The face is gently convex above the oral margin in profile. Pedicel of antennæ practically absent. First joint almost as long as last two, yellowish at base, blackish apically. Second and third about equal, the second black, the third brownish. Style pale. The vertex is slightly raised and the front bears a grooved depression which might perhaps be likened to an X. Occiput black and punctate, except about the cheeks. *Thorax:* and scutellum dull black, thickly punctate. Humeri, a narrow sutural stripe not confluent in the middle and the narrow posterior edge of the scutellum light yellow. Halteres, knob and pedicel ivory white. The pleuræ are black and punctate except for a long narrow diagonal yellow stripe reaching to the dorsal suture and a shorter cuneiform yellow spot behind and in front of

the metanotum. *Abdomen*: black, everywhere thickly punctate, the middle of the second segment brownish, the post border of this segment completely and of the third segment incompletely in the center with narrow pale yellow bands. First segment half as long as second, third a trifle shorter than fourth and first two segments a trifle longer than third and fourth, if viewed laterally. The yellow bands encircle the venter and the sides of the last ventral segments are emarginate. The first two segments are very slender, and the last two suddenly swell at base of the third into a compact subglobose body amazingly suggestive of certain wasps. The third and fourth segments are thus fused and the fourth bears faint whitish interrogation marks. *Legs*: brown, marked with light yellow, the basal and apico-dorsal and medial parts of the first femora, last two fore and mid tarsi, base and ventral surface of mid femora and a basal annulus of hind femora are light yellow. Legs punctate. *Wings*: margined with yellow, a darker spot apically and a smaller one about the stigma.

One female, Camerouns, Mete (G. Schwab). Type in the Museum of Comparative Zoology.

***Cerioides multipunctata* n. sp.**

Allied apparently to *Cerioides tredecempunctata* Brun, to which it traces in his key. It differs in the reddish color of abdomen, additional spots on thorax, besides minor differences.

Male. Length 15 mm. including antennae.

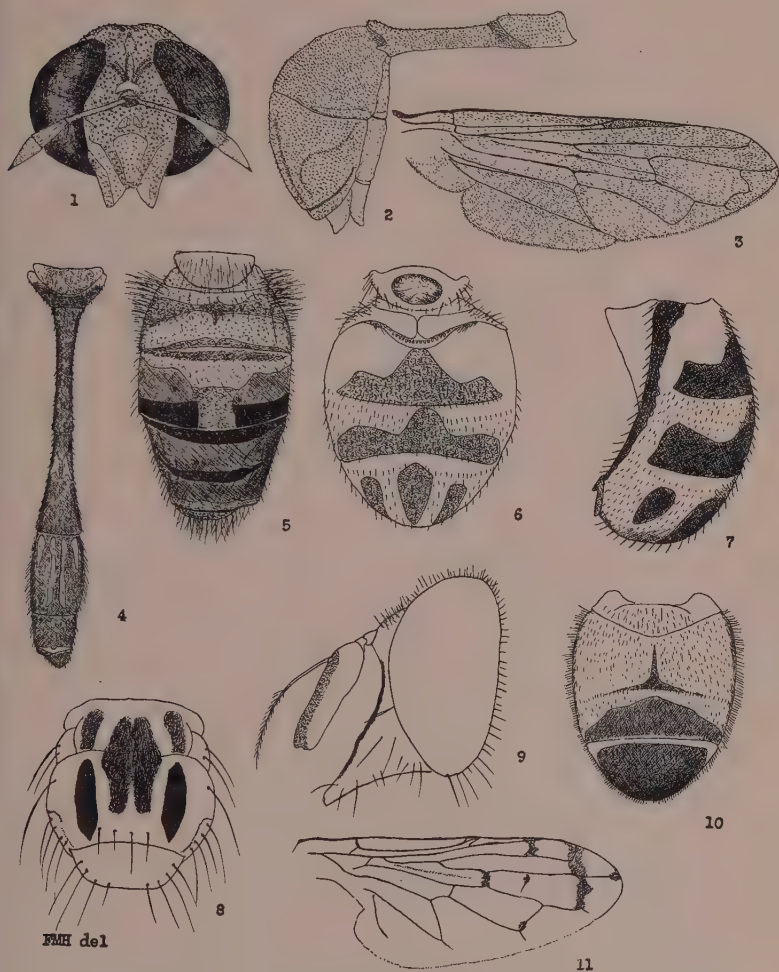
Head: eyes touching for distance of front, which is short. Vertical triangle very swollen, yellow, confluent with the swollen and thickened upper occiput. Face pale yellow. A median black stripe, red on its lowest part, encircles the base only of the antennal process and sends out a black diagonal downward projecting spur toward but not reaching the eye. Cheeks yellow, separated from face by a wide black stripe, the middle of which is a reddish stripe. Antennæ pedicel as long as first and second joint, the first barely longer than second. The second and third subequal, the color reddish brown; first and second joints slightly darker than the third; style whitish. *Thorax*: black, ground color of pleuræ black.

A spot on suture, narrow sutural stripe medialward, post-lateral stripe to scutellum, scutellum, except narrow base, humeri, mesopleuræ, metapleuræ, spot on upper sterno and pteropleuræ pale yellow. Squamæ and halteres pale yellow. *Abdomen*: outer basal angle of first abdominal segment noduliform, conspicuous postal borders on third and fourth segments, a narrow one on second pale yellow. Remainder of abdomen light brownish red, except the first segment, the remainder of which is black, and there is also a small median black spot posteriorly on the second segment. Fifth abdominal segment wholly reddish. *Legs*: reddish or light brown. Basal half or third of femora, bases of tibiæ yellow. *Wings*: with anterior border of brown.

Two males, Koolos, India (Carleton). Type male in the Museum of Comparative Zoology. Paratype in the author's collection.

EXPLANATION OF PLATE 10.

1. *Ceriodes delicatula* n. sp. (face)
2. *Ceriodes delicatula* n. sp. (lateral view of abdomen)
3. *Eumerus ergator* n. sp. (wing)
4. *Baccha banksi* n. sp. (abdomen)
5. *Pseudovolucella apimima* n. sp. (abdomen)
6. *Graptomyza flavorhyncha* n. sp. (dorsal view of abdomen)
7. *Graptomyza flavorhyncha* n. sp. (lateral view of abdomen)
8. *Volucella pallidithorax* n. sp. (dorsum of thorax)
9. *Graptomyza flavorhyncha* n. sp. (profile of head)
10. *Graptomyza setigloba* n. sp. (abdomen)
11. *Chrysogaster gewgaw* n. sp. (wing).



THE NESTING HABITS OF *BOMBUS MEDIUS*
CRESSON, THE MEXICAN BUMBLEBEE.

By PHIL RAU,
Kirkwood, Missouri.

Specimens of this bumblebee were collected at flowers at Cordoba and Jalapa in the State of Vera Cruz. At Tamazunchale, S. L. P., four nests were found among the dense growth of weeds in an abandoned banana field; these were pointed out to me by Mr. Olivarez, the manager of the El Sol Tourist Courts. Two of these nests were dug up on the night of July 7, 1940. Since Dr. T. H. Frison of the Illinois Natural History Survey (who kindly identified the bumblebees for me) writes that nothing is known of the life history of this species, the data of these two nests are herewith presented.

Both colonies were in slight cavities in the ground which evidently had been rodents nests, containing masses of fine roots, bits of narrow stems evenly cut, parts of leaves, and excrement of mice. There were no special galleries leading into the nests, but the comb was brought to view by brushing away the surface material to a depth of an inch and a quarter to an inch and three quarters.

When disturbed, the bees let out a steady, musical hum which, while not as loud as that of our Missouri *B. americanorum*, could be heard from a distance of ten to twelve feet. Their sting, while quite painful, is not so severe or lasting as that of its American relative. The workers of *B. medius* are smaller than those of *B. americanorum*, but the queens are almost equal in size.

An examination of the two nests, designated as A and B, revealed the following data. Nest A had one old queen, with wings badly frayed, and nest B had two queens, an old one with the tips of the wings badly damaged, and a young one with perfect wings and portions of the pubescence of a lighter, cleaner yellow. There were no males in either nest.

The number of workers in these colonies (and it is presumed that all the workers were at home, since the nests were taken at night) were 27 in Nest A and 63 in Nest B.¹

The number of empty cocoons from which workers had emerged numbered 39 and 84 respectively. These figures are highly interesting from the standpoint of mortality of the workers, for we find that the colony with 27 workers had actually given birth to 39, and the colony with 63 workers had produced 84. The two colonies therefore had lost 12 and 21 workers respectively. Worker bumblees must brave the vicissitudes of enemies and inclement environment in their foraging expeditions, and one expects a certain portion of the population to fare ill, but whether the figures given above are much or little one cannot tell, since there is little comparative data at hand. However, in a population study of one *B. americanorum* colony made at the end of the season in Missouri, the mortality was much less than in these nests, for out of 137 workers born in the colony during the season, 131 survived until near the end of the season.²

The pupæ and quiescent larvæ within cocoons numbered 17 in Nest A and 69 in Nest B, and young feeding larvæ (usually a small number of larvæ within a ball-like mass of pollen-paste) numbered five (2 in one mass and 3 in the other) in Nest A, and three (all in one mass) in Nest B.

The eggs were placed in small clusters in hollow spaces in the interior of the pollen-paste balls. These were without openings, and measured roughly about one-quarter inch in diameter, and were attached to cocoons and other objects in the nest. They were designed to serve as food for the tiny larvæ when they hatched from the eggs. In Nest A were four such masses, containing 8, 7, 6 and 4 eggs respectively. In Nest B were two balls, containing 2 and 6 eggs.

The total potential populations of these nests, including queens, workers, larvæ and eggs, were 75 and 145.

As is usual with bumblebees, pollen and nectar are stored in vats made of wax-like material; both are also stored in old cocoons from which the bees have emerged. Sometimes the cocoons are enlarged for this purpose by placing an

¹113 of Nest B emerged from their cocoons in my jars during the following few days.

²Entom. News, 52: 70-74, 1941.

addition of this wax-like substance on the rim of the cup. Thus in Nest B, 16 empty cocoons which had been used at one time or another as storage vats had had their capacity increased by extensions which varied from one-eighth inch to three-fourths inch. Two old cocoons completely filled with honey were tightly sealed with lids of wax. The largest pot, constructed entirely of wax, was in Nest B, and measured one inch in height by a half-inch in diameter. In both nests were several of these cocoon-vats that had remnants of pollen or honey, and in some cases they were half full of food at the time the nests were taken. In both nests some of the old cocoons had been partly bitten away, evidently by the workers, but why it had been done or what the bits of material had been used for is not known.

There were no males in the nests, neither were there any parasites or messmates, except for an unknown moth larva and an unknown moth cocoon among the cocoons.

On the whole, except for the tendency to slightly larger colonies, the life history of *Bombus medius* differs but little from that of our Missouri *Bombus americanorum*.

A NOTE ON THE LIFE-CYCLE OF *TETRAOPES*
FEMORATUS LECONTE
(CERAMBYCIDÆ)¹

BY R. W. WILLIAMS,
University of Illinois

While making a study of the bionomics of the common milkwood beetle, *Tetraopes tetrophthalmus* (Forst.), during the summer of 1940 at Urbana Illinois, I found, on August 11, a fully developed *Tetraopes* larva tunneling through the center of the horizontal root of the common milkweed, *Asclepias syriaca*. This larva was identified at the United States National Museum as being different from those thought to be *T. tetrophthalmus*. Unfortunately the species could not be determined since investigators had never associated larvæ similar to this one with an adult beetle. Since *tetrophthalmus* and *femoratus* were the only species of *Tetraopes* seen during my observations I believe that this single specimen was a representative of *femoratus*. The size of the individual would also warrant this conclusion since the adult of *femoratus* is the largest species of *Tetraopes* found in the state. This specimen was 23 mm. in length. Larvæ of *T. tetrophthalmus*, which were found during the fall of 1939, ranged from 13 to 19 mm. in length.

The first adult of *T. femoratus* was seen on July 23. It seemed highly improbable that eggs could have been deposited and the larvæ from these eggs could have reached a fully developed condition within a period of twenty days or even a month, assuming that the adults were present earlier. These facts, therefore, seem to indicate that at least some individuals of this species may spend two or more years in the larval condition about the roots of milkweed. Since the roots of these plants are perennial the larvæ would have a

¹Contribution No. 220 from the Entomological Laboratories of the University of Illinois.

continuous food supply to make a two-year developmental period possible. If the larval stage does actually last more than twelve months it should be possible to find larvæ at any time during the year. Although it may be a possibility to find these larvæ at any time the probability is very small, at least in the vicinity of Urbana, Illinois, which is very near the eastern limit of the range of this insect. Only 38 adults of *T. femoratus* were seen during the summer. A conservative estimate of the number of adults of *T. tetraphthalmus* seen during this period would be 8,000. An average of one plant out of three was found to be infested by this latter species. It can, therefore, be shown mathematically that there would be one chance in approximately 630 of finding a plant infested with *T. femoratus*. This again would be a conservative figure. The duration of the larval stage of any one individual is not known, however, it seems probable that it would be at least 23 months.

A NEW *STIZUS* FROM UTAH, WITH NOTES ON THE
OTHER NORTH AMERICAN SPECIES
(HYM.: SPHECIDÆ)

BY RICHARD DOW

Reading, Mass.

Stizus iridis, sp. nov.

Male.—Length about 20 mm. Yellow (Amber Yellow of Ridgway), with the following exceptions: mandibles dark ferruginous at apex with a ferruginous line along the interior margin; supra-antennal area with inconspicuous dark spots on each side; a broad transverse black band across the vertex including the ocelli, with an anterior extension along the median frontal groove; occiput with two black or ferruginous bands which connect the sides of the vertex with an extensive black area surrounding the foramen; antennæ with the posterior surface of the scape, the pedicel, and the flagellum ferruginous, the flagellum shading to black above and to orange toward the apex; pronotum with a black transverse band anteriorly; disk of mesoscutum and anterior margin between posterior lobes of pronotum black, either marked with two narrow yellowish longitudinal stripes (holotype), or two large spots of reddish brown (paratype), or simply black (paratype); dorsal surface of propodeum with a narrow black fascia along the anterior margin, wider and with a posterior median projection in the paratypes; sutures of propodeal area marked with black lines (partly obsolete in the holotype) which meet on the posterior surface; posterior surface with a black line extending anteriorly along the median groove; proepisterna black except for a small spot near the lateral angle of each front coxa; mesosternum with a large black maculation, medially interrupted in both paratypes, and ferruginous in one of them, emarginate (holotype) or narrowed anteriorly, but posteriorly with only a narrow

separation (along the ridge representing the mesopleural suture) from a dark spot near the ventral end of the meso-metapleural suture; remainder of mesopleura, except dorsal portion of mesepisterna, suffused with orange; meso-metapleural and metapleural-propodeal sutures marked with black lines; lateral areas of metasternum black; all coxæ black at base, at least anteriorly; remainder of legs partially suffused with orange; veins and membrane of fore wings yellowish basally, and somewhat fuliginous in the region of the first submarginal and marginal cells, the latter with a dark streak in the anterior half; hind wings yellowish; anterior face of first tergite more or less ferruginous, with a black basal area which (in the holotype and one paratype) has a narrow median projection and broad extensions at the sides (the other paratype has only a median projection which is shorter and does not reach the dorsal surface); apical and to some extent the lateral margins of all tergites orange; basal margins of tergites 2-5 orange or black (always black on tergites 4-5), each with a triangular median projection of the same color; sternites variously marked with orange and black.

Head (in facial view) broader than long, the posterior margin nearly straight; inner margins of eyes nearly straight, slightly converging anteriorly, nearest to each other where they reach the clypeus; clypeus emarginate both anteriorly and posteriorly (fig. 1), the peak of its convexity (seen in profile) anterior to the middle; supra-clypeal area posteriorly three times as broad as long, the sutures defining the frontal shield (*Stirnschildschen*) not distinct; antennal sockets separated from the eyes and from each other by somewhat less than their transverse diameter; space between the antennal sockets with a low ridge, carinate posteriorly; supra-antennal area with a broad median impression which extends posteriorly and encircles the anterior ocellus; posterior ocelli smaller than the anterior ocellus, separated from the eyes by one and a half times their diameter, and from each other by twice their diameter; latero-posterior margins of each posterior ocellus bordered by an impressed line which continues posteriorly in a medially concave curve to the vertical face of the occiput; genæ (in lateral view) rather narrow, wider below. Man-

dibles with a small tooth near the apex. Antennæ long enough to reach the posterior face of the propodeum; segments 9-12 much shorter than the four preceding, 9 about

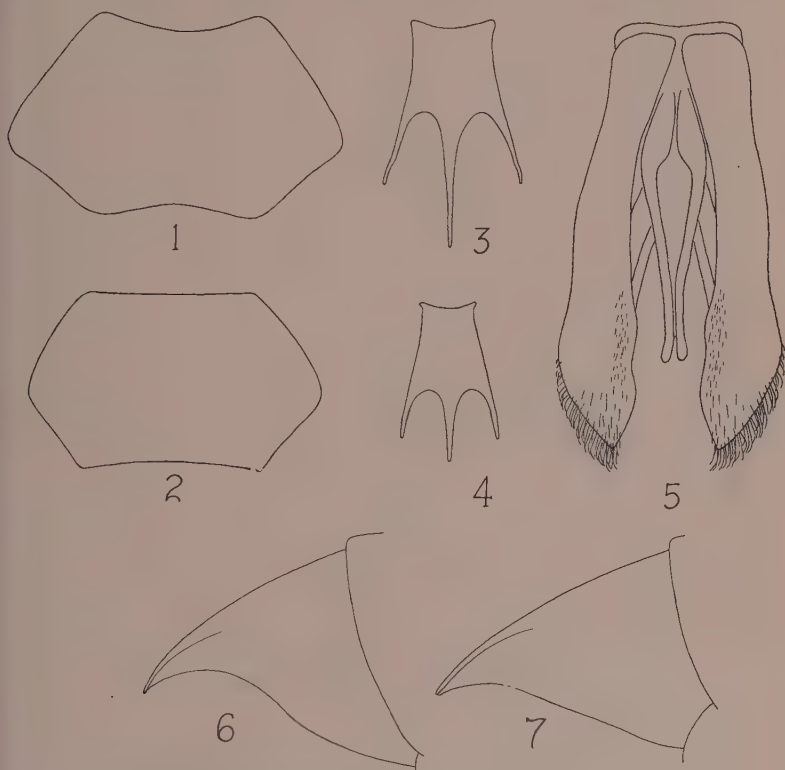


Figure 1. Clypeus of *Stizus iridis*, sp. nov.

Figure 2. Clypeus of *Stizus occidentalis* Parker (holotype male).

Figure 3. Eighth sternite of *Stizus iridis*, sp. nov.

Figure 4. Eighth sternite of *Stizus occidentalis* Parker (holotype male).

Figure 5. Male genitalia of *Stizus iridis*, sp. nov.

Figure 6. Sixth tergite of *Stizus brevipennis*, lateral outline.

Figure 7. Sixth tergite of *Stizus texanus*, lateral outline.

two-thirds as long as 8, 13 tapering to a round end and not emarginate within; tyloids present as linear carinae on segments 6-13, that on 5 very short, practically a tubercle.

Thorax (in dorsal view) somewhat rectangular; pronotum not elongate; parapsidal furrows not extended to the posterior margin of the mesoscutum, each represented by a slender carina with an extremely fine longitudinal impression; sutures defining the propodeal area strongly impressed; meso-metapleural suture sinuous, but not strongly curved anteriorly; hind angles of the propodeum tumid. Fore wings 17-18 mm. long, about four times as long as the distance between the posterior lateral angles of the mesoscutum, the first transverse cubital vein practically straight. Legs slender.

Abdomen large and elongate; first tergite with a flattened anterior face, in dorsal aspect roundly angulate anteriorly, the concave sides (as seen from above) parallel towards the base, diverging posteriorly.

The puncturation is fairly coarse and dense over most of the body. The clypeus and supraclypeal area, however, are very finely punctate, and anterior to the black band across the vertex are two areas with coarse, well-separated punctures.

The pubescence is pale and generally distributed, but longer, or at least more conspicuous, on the posterior half of the clypeus, the sides of the supraclypeal area, the anterior portion of the supra-antennal area, the vertex and the adjacent occiput, the lower portion of the genæ, the lower portion of the mesopleura, the mesosternum, the posterior angles of the propodeum, and the first tergite.

Female.—Unknown.

Types.—Holotype, Museum of Comparative Zoölogy, Cambridge, No. 23397. One paratype, U. S. National Museum, No. 55828. One paratype in the author's collection.

Type locality.—Rainbow Bridge National Monument, San Juan County, Utah.

Distribution.—Holotype male and two male paratypes taken at the type locality, July 16, 1935, by Professor C. T. Brues, who kindly supplied the following notes.

"The specimens of the new *Stizus* were collected in the canyon about half a mile above Rainbow Natural Bridge near the camp established for visitors. Close to the open space in which the camp is situated are cliffs that form one

of the cavelike hollows characteristic of the red sandstone of this region. In the early morning, over the steep talus slope to one side of this 'cave,' still in the shadow of the high cliff on the east, great numbers of these wasps were circling and darting about. In their erratic flight they would scarcely ever pause, and it was only after considerable effort that I finally secured three specimens. They did not appear at all wary and had it not been for the very insecure nature of the steep slope and loose rocks, they would have been taken quite easily. The wasps soon disappeared, long before any sunshine reached the spot. There was practically no vegetation on the slope where the wasps were observed."

Remarks.—The present species of *Stizus* is the fourth of the genus (as now restricted) to be described from North America. Of the remaining three it is most closely related to *occidentalis* Parker, a member of the *ruficornis* group. The male of the new species, like that of *occidentalis*, has the first transverse cubital vein practically straight, not evenly curved toward the apex of the wing. If the female should prove to have a scutellar pit (as it does in *occidentalis*), *iridis* may be assigned to the *ruficornis* group without question.

The types of *iridis* have been compared with the holotype male of *occidentalis*, which differs in the following structural details. In the holotype of *occidentalis* the clypeus is evenly convex in profile; it has a wider emargination anteriorly and the posterior margin is practically straight (fig. 2). Lateral to each posterior ocellus of the holotype of *occidentalis*, there is a longitudinal shining impression, about one-third the diameter of the ocellus in width; it extends posteriorly for a distance about equal to the diameter of the ocellus, but does not descend the vertical face of the occiput. Behind the anterior ocellus there is no circular impression. Linear tyloids are present on antennal segments 7-13, instead of 6-13 as in *iridis*; on the right antenna they are all conspicuous, but on the left less so, particularly on 7 and 8. In dorsal aspect the thorax appears more rounded anteriorly, and more pointed behind. The parapsidal furrows are represented by simple impressed lines. The posterior angles of the propodeum are less convex than in *iridis*, and the sutures defining the propodeal area are not

strongly impressed. The first tergite is distinctly rounded in dorsal aspect, and has a less sharply marked anterior face. Other structural differences occur in the eighth sternite (figs. 3 and 4) and the parameres of the genitalia (compare fig. 5 with Parker's fig. 29).

The author discovered another genitalic character while comparing his paratype of *iridis* with two males of *occidentalis* kindly loaned by Dr. C. D. Michener. In *occidentalis* the compressed shaft of the digitus, when viewed laterally, is rather uniform in width, but in *iridis* its ventral margin is strongly emarginate.

Stizus occidentalis Parker

1929. *Stizus occidentalis* Parker, Proc. U. S. Nat. Mus. 75 (5): 9, pl. 4, fig. 29. ♂, ♀.

This species was described from two specimens: a male from "San Diego County," California, collected by Coquillett, and a female from Florence, Arizona. As a result of the present author's recent trip to California, six additional specimens were located in various collections. This material, which considerably extends the known range, indicates that *occidentalis* is a desert species of the Lower Austral Region, and suggests that the holotype collected by Coquillett may really have been taken in what is now Imperial County, formerly the eastern part of San Diego County.

CALIFORNIA: Panamint Mts., Inyo Co.; May 29, 1937; N. W. Frazier, 1 ♂ [California Academy of Sciences]. Wild Rose Canyon, Panamint Mts., Inyo Co.; elevation, 3000 ft.; flying about flowers of *Prosopis chilensis* in noonday sunlight; May 28, 1937; C. D. Michener; 2 ♂, 1 ♀ [C. D. Michener]. Furnace Creek, Death Valley; on *Pluchea sericea*; May 1, 1927; P. H. Timberlake; 1 ♀ [University of California Citrus Experiment Station]. Eight miles south of Needles; on *Acacia greggii*; June 4, 1938; P. H. Timberlake; 1 ♀ [University of California Citrus Experiment Station].

Stizus brevipennis Walsh

1869. *Stizus brevipennis* Walsh, Amer. Entomologist 1: 162. ♂.

1875. *Larra brendeli* Taschenberg, Zeitschr. f. d. Ges. Naturwiss. 45: 361. ♂.
1879. *Megastizus brevipennis* Patton, Bull. U. S. Geol. Survey Terr. 5: 345. ♂, ♀.
1887. *Megastizus brevipennis* Cresson (pars), Synopsis: 278.
1892. *Stizus brevipennis* Handlirsch, Sitz. Akad. Wiss. Wien, Math.-nat. Cl., 101 (1): 174, pl. 1, fig. 13, pl. 2, fig. 28, pl. 3, fig. 15. ♂, ♀.
1895. *Stizus brevipennis* Fox, Proc. Acad. Nat. Sci. Philadelphia 1895: 266-268. ♂, ♀.
1941. *Megastizus brevipennis* Snodgrass, Smiths. Misc. Coll. 99 (14): pl. 19, figs. A-G. ♂.

The only published information relative to the prey of the North American species of *Stizus* is a brief note by F. X. Williams (1913, Kansas Univ. Sci. Bull. 8 (4): 198) to the effect that *brevipennis* "hunts in a manner quite similar to [*Tachytes*] *mandibularis*, examining the stems of *Helianthus*, etc., as she flies and finally finds her prey, a large *Xiphidium*." Dr. Williams has informed the author (*in litt.*) that the grasshopper in question is "a large short-winged adult ♀ of *Xiphidium*, now known as *Conocephalus*. It has a long, rather straight, ovipositor." In the selection of Orthoptera as prey, *brevipennis* agrees with the Old World species of *Stizus*, which, with two doubtful exceptions, have thus far been reported to capture either grasshoppers or mantids.

The male of *brevipennis* is very distinct from that of *texanus*. Besides the characters given in the accompanying key, the genitalia are entirely different. The females of these species are less readily distinguished, and as the pygidial character given by W. J. Fox does not appear to be valid, the present author has substituted another character of the sixth tergite which is quite satisfactory.

In the following list of specimens examined by the author, the record for Indian Head, Maryland, is by far the most surprising. It would certainly appear to be in error were it not for the occurrence of the species in central Florida.

FLORIDA: Cape Barrancas; C. Willard; 1 ♀ [M.C.Z.].

Gainesville; July 7 to 22, 1918; P. W. Fattig; 5 ♂ [U.S.N.M.].

ILLINOIS: 2 ♂ [A.M.N.H.].

IOWA: Mount Pleasant; July 1920; 1 ♀ [U.S.N.M.].

KANSAS: 1 ♀ [U.S.N.M.]. Douglas Co.; 900 ft.; F. H. Snow; 1 ♂ [U.S.N.M.]. Riley Co.; July 9 and 31; Popenoe; 1 ♀ and 1 ♂ [U.S.N.M.]. Dickinson Co.; August; Bridwell; 1 ♀ [U.S.N.M.]. Wellington; H. R. Watts; 1 ♀ [U.S.N.M.].

MARYLAND: Indian Head; August 23, 1902; Bridwell; 1 ♂ [U.S.N.M.].

MISSOURI: St. Louis; July 1911; P. Rau; 1 ♀ [U.S.N.M.].

NEBRASKA: Cambridge; July 26, 1921, August 2, 1921, and August 22, 1923; A. P. Morse; 1 ♀, 1 ♂ [M.C.Z.], and 1 ♂ [Richard Dow].

OKLAHOMA: Ardmore; July 11, and August 18, 1905; C. R. Jones; 1 ♂ and 1 ♀ [U.S.N.M.].

SOUTH DAKOTA: Springfield; August 27, 1926; H. C. Severin; 1 ♂ [M.C.Z.].

TEXAS: Belfrage [collector]; 1 ♂, 1 ♀ [U.S.N.M.]. San Antonio; H. B. Parks; 1 ♂ [U.S.N.M.].

WISCONSIN: Milwaukee; August 12, 1907; S. Graenicher; 1 ♂ [M.C.Z.].

Stizus texanus Cresson

1872. *Stizus texanus* Cresson, Trans. Am. Ent. Soc. 4: 222. ♂, ♀.

1879. *Megastizus texanus* Patton, Bull. U. S. Geol. Survey Terr. 5: 345. ♂, ♀.

1887. *Megastizus brevipennis* Cresson (pars), Synopsis: 278.

1892. *Stizus texanus* Handlirsch, Sitz. Akad. Wiss. Wien, Math.-nat. Cl., 101 (1): 176, pl. 1, figs. 6, 14, 15, pl. 2, fig. 29, pl. 3, fig. 16. ♂, ♀.

1895. *Stizus texanus* Fox, Proc. Acad. Nat. Sci. Philadelphia 1895: 267-268. ♂, ♀.

In the American Museum of Natural History there is a female of *texanus* from Tucson, Arizona, a locality con-

siderably west of the previously known range of the species. Though the head and thorax are normal in coloration, the abdomen is remarkable for the extent of the yellow maculations. Whereas the lateral spots on tergites 3 and 4 are usually well separated in *texanus*, in this specimen they are united medially to form broad continuous fasciæ, the first of which is deeply emarginate anteriorly, but the second less so. There is also a broad fascia on tergite 5 which covers most of the exposed portion of the sclerite. Even the yellow spots on sternites 2, 3, and 4 are exceptionally large.

The following records are of specimens examined by the author.

ARIZONA: Tucson; "Creosote bush assn."; August 6, 1906; G. von Krockow; 1 ♀ [A.M.N.H.].

TEXAS: 2 ♂ [M.C.Z.]. Lincecum [collector]; 1 ♀ [M.C.Z.]. Alpine; June 4, 1927 [?]; 1 ♂ [U.S.N.M.]. Cotulla; June 21, 1906; H. Caley; 1 ♂, 4 ♀ [U.S.N.M.]. "Dallas"; Boll; 9 ♂, 9 ♀ [M.C.Z.] and 1 ♂ [Richard Dow]. Laredo; May 16, 1924; 2 ♀ [U.S.N.M.]. San Antonio: May 27, 1937; 3 ♂ [U.S.N.M.].

In the following key to the known forms of *Stizus* occurring in North America, the author is following the division of the Stizini proposed by J. B. Parker in 1929 (Proc. U. S. Nat. Mus. 75 (5): 7-11). According to this classification, *Stizus unicinctus* Say belongs in the genus *Stizoides* (equivalent to the *tridentatus* group of Handlirsch, Berland, and Arnold), and the genus *Bembecinus* includes the forms with a concave propodeum. The name *Megastizus* is applicable to *Stizus brevipennis* and *texanus*, but whether these species form a group worthy of subgeneric rank is a question the author prefers to leave undecided until he has studied more material from other regions.

1. Males 2.
Females 5.
2. Antennæ without longitudinal carinæ on segments 9 and 10. Seventh tergite with large ventral lobes..... 3.
Antennæ with longitudinal carinæ on segments 9 and 10. Seventh tergite without large ventral lobes 4.

3. Anterior margin of clypeus laterally with blunt teeth, its shallow nearly straight emargination with two low projections. Narrowed apex of seventh tergite broadly rounded; ventral lobes of seventh tergite broad, about twice as long as wide, broadly triangular at apex. Apex of seventh sternite broadly triangular, the more heavily sclerotized portion spear-shaped. Median spine of eighth sternite borne on a spear-shaped projection much narrower than the basal portion *brevipennis* Walsh

Anterior margin of clypeus evenly rounded. Apex of seventh tergite narrowed into a flattened truncate projection with a small but distinct median emargination; ventral lobes of seventh tergite slender, nearly three times as long as wide, narrowly triangular at apex. Seventh sternite narrowly triangular, truncate at apex, the more heavily sclerotized portion of similar shape. Median spine of eighth sternite on a broad triangular projection *texanus* Cress.

4. Posterior margin of clypeus practically straight. Antennal segments 7-13 with distinct tyloids. Sides of first tergite (in dorsal view) slightly convex. Thorax conspicuously hairy. Mesopleura, metapleura, and propodeum mostly or entirely black *occidentalis* Parker

Posterior margin of clypeus emarginate. Antennal segments 6-13 with distinct tyloids. Sides of first tergite (in dorsal view) concave. Thorax not conspicuously hairy. Mesopleura, metapleura, and propodeum almost entirely yellow *iridis*, sp. nov.

5. Sixth tergite with a pygidial area 6.

Sixth tergite without a pygidial area defined by lateral ridges. Posterior margin of clypeus practically straight. Lateral margins of first tergite slightly convex. Thorax conspicuously hairy. Mesopleura, metapleura, and propodeum mostly or entirely black *occidentalis* Parker

6. Anterior margin of clypeus with a broadly V-shaped emargination. Lateral margins of sixth tergite strongly sinuous (fig. 6)*brevipennis* Walsh

Anterior margin of clypeus with a shallow rounded emargination. Lateral margins of sixth tergite with the basal three-quarters nearly straight (fig. 7)
.....*texanus* Cress.

Acknowledgments.—The author is much obliged to the numerous entomologists and museums whose material he has been permitted to study, and especially to Professor Brues for the privilege of describing the new species and permission to retain one of the paratypes. For assistance in the preparation of this paper, he is greatly indebted to the late Miss Grace A. Sandhouse and to Mr. Karl V. Krombein, both of the Bureau of Entomology and Plant Quarantine.

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